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NATURAL RESOURCES  
RESEARCH PROGRAM

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PROCEEDINGS,  
15TH ANNUAL MEETING,  
NATURAL RESOURCES  
RESEARCH PROGRAM

18-19 APRIL 1990  
ATLANTA, GEORGIA

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October 1990

Final Report

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<p><b>The 15th Annual Meeting of the US Army Corps of Engineers Natural Resources Research Program was held in Atlanta, GA, on 18-19 April 1990 to review current research activities, discuss future research, and afford the opportunity for presentation of operational needs. Papers presented at the meeting are included in this report.</b></p> <p><b>Keywords:</b> <i>Natural resources; Research/resource management; Recreation/facilities; Symposia.</i></p> <p style="text-align: right;"><i>(MM) ←</i></p>				
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## PREFACE

The 15th Annual Meeting of the US Army Corps of Engineers Natural Resources Research Program was conducted in Atlanta, GA, on 18-19 April 1990. The program review, required by the Directorate of Research and Development, was organized by personnel of the Natural Resources Research Program (NRRP), which is managed under the Environmental Resources Research and Assistance Programs (ERRAP) of the Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES), Vicksburg, MS.

Presentations by WES personnel were prepared under the general supervision of Dr. John Harrison, Chief, EL. Mr. J. Lewis Decell was Program Manager, ERRAP. Ms. Judy Rice (CECW-ON) and Mr. Robert Daniel (CECW-PD) were Technical Monitors for the Headquarters, US Army Corps of Engineers.

Dr. A. J. Anderson, Assistant Program Manager, ERRAP, and Ms. Billie H. Skinner, Program Managers Office, EL, coordinated the organizational activities of the meeting and efforts leading to the publication of this report. The report was edited by Ms. Janean Shirley of the WES Information Technology Laboratory (ITL). Ms. Betty Watson, ITL, designed and composed the layout.

Commander and Director of WES was COL Larry B. Fulton, EN. Technical Director was Dr. Robert W. Whalin.



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## **AGENDA**

### **15th Annual Meeting US Army Corps of Engineers NATURAL RESOURCES RESEARCH PROGRAM**

**Atlanta, Georgia  
18-19 April 1990**

**WEDNESDAY, 18 APRIL 1990  
General Session, Gateway North**

- 8:00 a.m. Welcome—Acting Assistant Chief/Construction-Operations
- 8:10 a.m. Announcements and General Comments—Dr. A. Anderson, WES
- 8:15 a.m. Judith Rice—NRRP Technical Monitor
- 8:30 a.m. Robert Daniel—NRRP Technical Monitor, Chief, Economics and Social Analysis Branch, HQ
- 8:45 a.m. SAD Moderator—Gerald Purvis
  - Panel—Susan Whittington—SAD, Pete Milam—Jacksonville  
Mike Miller—Mobile, Phil Parsley—Savannah
- 9:45 a.m. Break
- 10:00 a.m. Paul Wright—US Forest Service
- 10:30 a.m. Dr. Dominic Dottavio—National Park Service
- 11:00 a.m. Seth Mott and Dr. Frank Bowers—US Fish & Wildlife Service
- 11:45 a.m. Lunch
- 1:00 p.m. Lewis Decell—Manager, NRRP, WES
- 1:30 p.m. Break
- 1:45 p.m. Breakout—Div/Dist/Project  
Breakout—HQ/WES
- 3:30 p.m. Break
- 4:00 p.m. Report on Div/Dist Breakout Session
- 4:30 p.m. Adjourn
- 5:30 ! Reception (Cash Bar) Gateway South
- 7:00 p.m.

**THURSDAY, 19 APRIL 1990**  
**Research Program Review**

8:00 a.m. Announcements—Dr. A. Anderson

*Existing Work Units*

8:15 a.m. 32502 – Status Report on Visitation Survey Procedures  
8:30 a.m. 32269 – Economic Impacts of Corps-Managed Recreation Areas  
8:50 a.m. 32574 – Recreation Regional Demand Model  
9:10 a.m. 31544 – Research and Demonstration System  
9:35 a.m. 32503 – Guidelines for Improving Operational Management Plans  
9:50 a.m. Break

*Proposed Work Units*

10:15 a.m. 375-2 – Management of Water-Based Recreation Opportunities  
10:25 a.m. 375-3 – Improving Accuracy, Efficiency and Utility of the NRMS  
10:35 a.m. 375-4 – Operations and Maintenance System  
10:45 a.m. 375-6 – Survey of Waterfowl Management Practices at CE Projects  
10:55 a.m. 375-7 – Expert Systems for Natural Resource Management  
11:05 a.m. 375-9 – Multiple Species Management on Corps Project Lands  
11:15 a.m. 375-8 – Evaluating the Effectiveness of Signing for Protection of Archaeological Sites  
11:25 a.m. 375-5 – Measuring the Effects of Alternative Recreation Fee Programs  
11:45 a.m. Lunch  
1:00 p.m. FY91 CW R&D Program Review  
2:30 p.m. Break  
3:30 p.m. Adjourn

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# **15TH ANNUAL MEETING US ARMY CORPS OF ENGINEERS NATURAL RESOURCES RESEARCH PROGRAM**

## **INTRODUCTION**

The annual meeting of the Corps of Engineers Natural Resources Research Program (NRRP) provides professional presentations of current research and discussions related to Corps activities and problems. In conjunction with this meeting, the Civil Works Research and Development Program Review is held. This review is attended by the Technical Monitors and representatives of the Civil Works Research and Development Directorate of the Headquarters, US Army Corps of Engineers (HQUSACE); the Program Manager, NRRP; researchers; and representatives of the operations and planning elements of the Corps Division and District offices, including those designated as Field Review Group (FRG) members of the research program.

The overall objective of this annual meeting is to thoroughly review the Corps' natural resources/recreation needs and establish priorities for future research, such that identified needs are satisfied in a timely manner.

The technical findings of each research effort conducted under the NRRP are reported to the Manager, NRRP, US Army Engineer Waterways Experiment Station, in the form of quarterly progress reports and as miscellaneous papers, instruction reports, and technical reports. The miscellaneous papers, instruction reports, and technical reports are distributed widely in order to transfer technology to both the operating elements and the technical community.

Technology transfer is also accomplished through the Natural Resources Technical Support Program (NRTS), through the publication of the information exchange bulletin *RECNOTES*, and the conduct of workshops. Upon request, NRTS provides direct assistance to the operating elements and the HQUSACE regarding problems that need rapid application of technology.

The printed proceedings of the annual meetings and program reviews are intended to provide Corps management and the FRG with an annual summary to ensure that the research is being properly focused on the Corps' operational needs nationwide.

The contents of this report include the presentation and discussions of the 15th Annual Meeting held in Atlanta, GA, on 18-19 April 1990.

## NATURAL RESOURCES RESEARCH PROGRAM

by  
Judy Rice\*

Good Morning. I would like to thank Gerald Purvis and the South Atlantic Division for offering to host this meeting. It's comforting to think there are Corps of Engineers offices still functioning in a usual and organized fashion—capable of finding their files, phones, and computers—and capable of pulling off a host job. There may, in fact, be life as we knew it before the fire.

At last year's program review, I begged off on reviewing or critiquing the program as the new kid on the block. I regret that I've not had as much time during this past year to spend on the research program as I would have liked. But, I've developed some opinions about the program this year, and I have some observations to make.

First of all, I would like to congratulate Andy and Lewis and the rest of the US Army Engineer Waterways Experiment Station (WES) staff on the progress we've made in the program since last year's program review. I think their conscientious, hard work shows. And I'd like to thank all of you for your continuing interest and support of the program.

Next, I retain my certainty that the research program is important and relevant. If anything, that certainty has been strengthened during my association with the program this past year. I wonder, however, if we are addressing our real needs as a field-based, field-oriented organization. One of my big surprises and disappointments this year in this program has been the lack of research topics coming from the field. In the year and a half I've been Technical Monitor, I have seen not a single suggestion for a research topic from the field—not one. Maybe Lewis or Andy have, but I haven't. And I don't mean topics that were evaluated and considered researchable—I mean topics submitted. None. And looking at the future work units proposed in our package, each one appears to have been proposed by a researcher at WES. Clearly, research proposed by researchers is perfectly valid; however, we should also be including field-proposed research. Do we have a lack of interest in the research program? Are we not getting information to the field about the program and how to submit ideas? Maybe a little of each.

I chafe at the limited funding we receive for our research efforts, but I question whether we are spending those dollars we have in the most efficient, effective manner. We have studies that have been ongoing for several years, from which we seem to have realized less than we might have expected in directly usable information. I wonder if this represents a weakness on our part in clearly defining at the outset what we want from a work unit and when we want it.

I'm concerned about our timing. By the time we have identified an issue we can agree on, funded it, developed a plan of work and begun study, the issue can become a non-issue. Frequently, we have a need for research with a shorter turnaround for results—somewhere between a Natural Resources Technical Support Program request and the long scheduling

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\* NRRP Technical Monitor, Natural Resources Management Branch.

currently required. We should be able to fast-track some research to give us usable information more quickly.

I think we have improved the work unit documentation. I can more easily understand the goal and direction of a particular work unit, since the documentation rewrite. I very much like the addition of a plan of study as a milestone, as well as the routine development of a *RECNOTES* article for technology transfer. I still believe, however, that we can improve the readability of our materials—both documentation and reports—for non-research, layperson consumption.

We have a good functioning research program now, but any program can be improved. A good program can get even better. We need to make sure that we are researching the right things and that we are getting the right products when we need them. We need to make the program more immediate, more vital to the field. We need to get the results of our research work distributed in a simple, readable form. Problem—Answer. Then, we need to give the field an easy, quick way to suggest a research topic. Here is my problem—Can it be researched?

This seems to me to be mainly a communications effort. We already have the process, the organization, and the people to make our program more effective. What we need to do is get the word out, to get more involvement at the field level. It's a little like the Corps Recreation Study that Dave Wahus has been working with for the last 6 months. All we have to do is tell our story—and the program will sell itself. With the recreation study, we will have a discrete document to hand a preselected reviewing audience—the right audience. Lewis has been working diligently on a somewhat similar document to explain the Natural Resources Research Program (NRRP). When we are satisfied it tells our program adequately, we will need to get it to the right audience—primarily project level staff—and I hope we will begin to see increased field involvement.

I'm disappointed we did not manage to pull off the mid-year meeting we had planned last year in Portland. I think it would have been very helpful to all get together to discuss the work units in detail, as well as to discuss how the program is working or not working in general. Several offices had difficulty getting travel money to come to this meeting—we may not be able to afford the luxury of a second meeting this year.

As funds become tighter, and competition for travel dollars gets tougher, we need to make sure those persons most interested in the research program are those designated as Field Review Group (FRG) members and District coordinators. When choices have to be made about which meetings to go to, I want these people to choose to come to the program review. When faced with competing work demands due to decreasing staff and increasing work load, I want the FRG members and District coordinators to choose to focus attention on the research program. One of the things I had intended to do before this meeting and didn't get done was ask everyone to review who their designated NRRP representatives are to make sure the right persons are identified. We will do that before our next meeting. Maybe we can get the new list included in the Program Review Proceedings before it is published.

As far as the work units themselves go, the economic impacts unit seems to me to be one of our highest priority units. I see a real need for the information we expect out of this effort

to help us quantify and justify our program. Again, scarce resources and competing missions; we need to be able to show how we stack up against flood control in providing public benefits. We will need this information to support the recreation study and to help implement its recommendations. I hear the same sentiment regularly from other Corps people around the county. In fact, I was tasked by several people who couldn't be here this week to carry the message that this is an important effort, and we should continue to emphasize it.

Having carried that message, I will refrain from comment on the remaining work units until our specific discussion of them tomorrow. Again, I thank you for your interest and participation in this meeting and in the program. And I look forward to continuing working with you to tailor an integrated, relevant research program that meets our needs in the most efficient and effective manner.

## **SOUTH ATLANTIC DIVISION (SAD) PANEL DISCUSSION**

### **MARKETING THE RESEARCH PROGRAM TO NATURAL RESOURCES MANAGEMENT 10:50 to 11:50 a.m., Wednesday, 18 April 1990**

**Gerald Purvis,\* Moderator**

We are not realizing the full potential from our research program. I fully support this program and believe that it can work for us. But, there is a general negative attitude about the research program and I believe there are two broad reasons: (a) lack of communication, and (b) time required to produce usable results.

The communication problem is not entirely the fault of the US Army Engineer Waterways Experiment Station (WES), Headquarters, US Army Corps of Engineers (HQUSACE), or the field operating agencies (FOAs). We all share in the responsibility for the success of this program. And I think we would all agree we need to do a better job in communication.

The amount of time required to complete a work unit and get usable results to the field creates frustration within the operational elements. We must improve this procedure or perception before the research program will be credible.

We have seen more involvement by WES in policy issues. This may be because there has been a void at the HQUSACE level, but we must avoid the perception that WES is providing policy guidance.

The purpose of the panel discussion is to provide several views on constructive ways to improve the Natural Resource Management (NRM) research program. The panel will focus on the following broad topics: (a) the role of research in the recreation and NRM programs; (b) current issues in NRM; and (c) ways to strengthen and improve the program.

#### **What Is The Role of Research in the Corps' Recreation/NRM Program?**

**Susan S. Whittington\***

In 1976, HQUSACE originated the concept of the Natural Resources Research Program (NRRP) through a study conducted by the Institute for Water Resources. I would like to review with you some of the more important statements contained in this concept paper. I think it is important for us to keep the "role" in mind as we review and rank proposals this week.

Research has one primary function and that is to improve predictability—the view of the future.

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\* South Atlantic Division, Atlanta, GA.

Research will not make the decisions about the future, nor will it provide the decision maker with automatic knowledge leading to decisions. At best, it can aid in providing a sounder basis for decisions.... .

Research in this case is considered primarily as a service function to the resource managers. ... it must become an integral part of the management process, not a separate area. Its success should be measured in the use of knowledge rather than the production of reports or other publications.

The most usual evidence or form in which the knowledge will appear will be as data cranked into the regular administrative or management process.

One of the prime focuses for research should be the development of a systematic feedback mechanism whereby the Corps' experience, expressed in data form, can become a regular part of operating procedure.

When considered as an operating service to improve predictability, the role of research is aimed primarily at short-run problems. Although many problems may be of a long-run nature, research attacks those problems by providing knowledge incrementally as the problem is investigated.

To summarize these statements, the primary emphasis for our program should be on providing a sounder basis for making decisions about the future. Is our program consistent with this role? We need to ask ourselves this question. I think we would all agree that the answer is "Yes" and "No."

Yes — Some research projects have improved predictability such as carrying capacities, Recreation Research Demonstration System, and economic impacts. *RECNOTES* has been established as a mechanism to provide feedback on research and operational issues. And, a short-term research service has been established through the Natural Resources Technical Support (NRTS) and one-stop program.

No — Some managers expect research to make the decisions for them. Research has not been adequately marketed as a service to the resource managers nor have managers allowed research to become an integral part of the management process. While *RECNOTES* has been established, it does not provide sufficient feedback. And, while the NRTS Program has been established, the primary role of the research program has been geared toward long-term research.

Why has our program not been consistent with this role? ... Lack of communication!

Lack of communication between the researcher and practitioner is a common problem in all agencies and companies. We often find ourselves talking to those in our particular area and not with anyone else. Much communication is lost when we share information within groups and not between them.

When we do share information between groups, we often have a tendency to each talk "our own language," which also hinders communication.

Practitioners can easily identify problems in the NRM field but we often have difficulty relating the problems and eventual solutions to research. Part of the difficulty is the perception that research will take years to complete and we must have the solution now.

On the other hand, researchers can easily identify researchable topics but often have difficulty identifying which topics will provide meaningful results for use in the decision-making process. Part of this difficulty is due to the lack of involvement that researchers have in the day-to-day operations in NRM.

Many or most NRM personnel are not aware of how to request research services from WES. I realize this has been published in *RECNOTES*, explained at NRM conferences, etc., but people still do not understand. For the sake of those who need a refresher: (a) Nationwide research includes items of nationwide application that are included in this program review meeting and funded by HQUSACE. Any Corps employee may submit a research topic for consideration. (b) Reimbursable research includes items of local application that are requested by and funded by the project, District, and/or Division. (c) The NRTS Program provides free technical assistance to a project, District, or Division on any issue requiring less than 1 week. Funds are provided by HQUSACE.

In summary, one of our biggest problems is a lack of communication about how the program works and how it can benefit the practitioner.

### **Current Researchable Issues in NRM as Identified by SAD Districts**

#### **Bob Bain\***

What I plan to do for the next few minutes is to communicate to you some current issues in SAD that we feel could lead to possible NRM research work units. We are not suggesting these as work units, but we do feel that they may have possibilities. I have also included in each discussion the District or Division office that submitted the topic and a point of contact.

**Visitation** —We need to hire an independent firm to survey representative areas across the country to establish nationwide load factors and visitor hour conversion factors for types of recreation areas. We may be able to use the RDUs and might have to look at this on a regional basis rather than nationwide. Visitation is becoming more and more important to us, i.e., performance indicators, drought impacts, and economic impacts. We must improve our credibility! This topic was suggested by Mike Miller, Mobile District.

**Water Quality** —We need to identify causes of water quality problems and recommendations for improvements at highly developed lakes such as Lake Lanier; i.e., are adjacent developments greatly impacting these lakes? Many of these lakes already have baseline data postimpoundment surveys to compare with current conditions. This topic was suggested by Mike Miller, Mobile District.

**Impacts of Changing Water Levels** —We need to document impacts from drought and flooding conditions on project visitation, local economies, and the environment. While

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\* Richard B. Russell Lake, Elberton, GA.

much information has been collected during the past 5 years, we need to legitimize a procedure for determining impacts. This topic was suggested by Susan Whittington, SAD.

***High Fecal Coliform Counts at Designated Swimming Beaches***—We need to develop a procedure for predicting periods when fecal coliform counts could exceed state water quality criteria at designated beaches. High counts could be related to runoff following heavy rains but this has not been proven. This topic was suggested by Mike Miller, Mobile District, and Susan Whittington, SAD.

***Visitor Preferences for Day Use and Camping Facilities***—We need to know what facilities visitors prefer at Corps camping and day-use areas. Such information could also help us to push for additional facilities in our cost-sharing policy or at least defend the current facilities list. This topic was suggested by Mike Miller, Mobile District, and Susan Whittington, SAD.

***Shoreline Erosion***—We need to identify cost-efficient and small-scale erosion control methods that could be used by adjacent landowners, e.g., water-tolerant plants, etc. This topic was suggested by Dan Grimsley, Wilmington District, and Mike Miller, Mobile District.

***Recreation Area Closures***—We need to document costs to close areas, develop criteria for evaluating areas, and identify minimum facilities that should remain in partially closed areas, etc. This topic was suggested by Susan Whittington, SAD.

***Geographic Information System Capabilities***—We need to evaluate systems and make recommendations on data and applications that would be useful in the decision-making process. This topic was suggested by Phil Parsley, Savannah District, and Susan Whittington, SAD.

***Lake Carrying Capacities***—We need a method for determining carrying capacities of our lakes (currently included in the research program) to include methods for evaluating boating use zones, e.g., skiing only, fishing only, etc. (not included, to our knowledge, in the study). This topic was suggested by Brad Keshlear, SAD.

### **What Can We Do to Improve the Program?**

#### **Pete Milam\***

First and probably most important, we must improve our communications. How can we do this? ...

We have a great resource for information exchange in *RECNOTES*. However, we could improve information exchange by implementing the following:

- a. Publish summaries of reimbursable research and NRTS requests.
- b. Publish an article describing the procedures for submitting research topics and for requesting reimbursable and NRTS services.

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\* Jacksonville District, Jacksonville, FL.

- c. Include a brief statement in each issue on how to request reimbursable and NRTS services.
- d. Publish a brief description of new starts when they are funded.
- e. Publish *RECNOTES* more frequently. CECW-ON could require each Division to be responsible for submitting at least one article each year. WES could also prepare an article summarizing the status of at least one nationwide research project for each publication.
- f. A directory could be developed, by topic, of all NRM-related nationwide research, reimbursable research, NRTS support, and *RECNOTES* articles provided by WES. Ideally, this would be an on-line directory that could be easily updated and accessed.
- g. An "adopt-a-researcher" and "adopt-a-practitioner" cross-training program could be encouraged and possibly funded. This would allow researchers access to topics and populations, and would allow practitioners more involvement in the research process.
- h. We could all learn to communicate in the "user's" language rather than the "researcher's" or the "practitioner's" language. This would help bring us back to the reality of the problem and as a result help in providing meaningful results.

We could open our NRM programs to evaluation, research, and innovation. However, we must be willing to take risks.

And finally, we could propose cooperative projects involving both researchers and field personnel and educate those we lead or supervise concerning the value of having both the researcher perspective and the operational perspective.

There are three other major areas for improvement that we could pursue that are not directly related to communications:

First, we need to relook at the 1986 NRRP task force report and take appropriate actions. I understand Lewis Decell has already begun this effort and will be working with Judy Rice to determine if a task group should be reconvened.

Second, we need to restructure the nationwide research program to focus on short-term problems as well as long-term problems. We could consider using local universities for reimbursable and NRTS requests so that WES manpower can concentrate on the nationwide program. We also need to communicate to the field the reasons for long-term research projects and any delays that occur to both long- and short-term projects. We should ensure that interim reports are published and distributed on all long-term research projects.

And finally, we need to establish critical milestone reviews to ensure that the work unit is progressing as intended, staying on schedule, and that its progress is communicated to the field.

**Gerald Purvis, Moderator**

Two procedural items that we must work on are procedures for submitting research issues and critical milestone reviews. I believe we each have a challenge to make this program work for us.

**Headquarters** has the challenge of providing dynamic policy directions to keep up with the programs.

**WES** has the challenge of providing meaningful, timely, and usable results. The perception that WES is looking for work units or reimbursable work just to get money must be overcome. Your integrity and credibility is on the line. The long-term pain is not worth the short-term pleasure. NRTS is an excellent concept but you must try to avoid the "If you give me money, I can really give you an answer" syndrome. And, you must remember that we are in a time of diminishing budgets.

**FOAs** have the challenge of marketing the program to all of those involved. This is not just an operations program or just a planning program. It includes both as well as other elements such as real estate. We must all "learn" the program and procedures and believe in them before we will be truly successful.

# NATURAL RESOURCES RESEARCH PROGRAM

## ENVIRONMENTAL RESOURCES RESEARCH AND ASSISTANCE PROGRAMS

by  
J. Lewis Decell, Manager\*

**"The difficulty lies not in the new ideas - but in escaping from the old ones"**

I want to talk about two things today, the Natural Resources Research Program (NRRP) and also give you a report on activities conducted through the Natural Resources Technical Support Program (NRTS).

First, an overview of the current NRRP; which you will hear in more detail tomorrow as part of the Civil Works Research and Demonstration (R&D) Program Review. Then some things that I discussed at last year's meeting in Omaha, and a status report of my perspective of how well I think we are doing.

### General

The intensity of daily management of the Corps' Natural Resources used for recreation can be gauged by the following data:

#### 1987 Visitation and User Fee Receipts, Percentages

Agency	Visitation	User Fee Receipts	Federal Lands
Forest Service	38.34	26.83	26.9
Corps of Engineers	29.16	33.11	1.2
National Park Service	18.45	35.60	10.7
Bureau of Land Management	6.93	0.79	47.6
Bureau of Reclamation	5.11	2.01	0.6
Tennessee Valley Authority	1.05	1.53	0.14
Fish & Wildlife Service	0.96	0.13	12.8

The Corps of Engineers ranks second nationally as measured by visitation and/or by fee receipts. This level of activity takes place on only 1.2 percent of the Federal lands. Such intensity of activity requires that Natural Resource Managers at all levels, and Rangers at the project level, be provided with technology and methods that enable them to efficiently respond to the public and environmental needs, while meeting the Corps-designated missions. The NRRP should provide both technology and methods in an efficient and effective manner. At the present funding levels, however, it is very difficult to provide anything other than the most immediate needs. Long-term continuity is almost non-existent, because immediate needs change yearly if not more frequently. In the absence of an overall

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\* US Army Engineer Waterways Experiment Station, Vicksburg, MS.

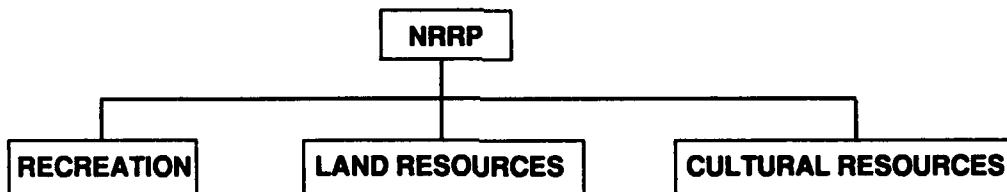
long-range Natural Resource Management (NRM) strategy, it is difficult to focus a strategy for the NRRP that is meaningful to the NRM managers in the field.

### **Objective**

The overall objective of the NRRP is to "Provide the capability to continually increase the effectiveness and efficiency of planning and operations of the Corps' projects." More specifically, the NRRP cannot solve the field's problems, but can provide the field with the capability to solve the problem. When the field identifies a recurring problem, we must focus on the lack of capability, and then structure a work unit that develops the capability, and provide it in a form that the field dictates.

### **Overall Structure of the NRRP**

For the past 2 years, I have been trying to develop a technology structure for the NRRP. Such a structure must identify technology areas that are identifiable with the Corps NRM missions. The research work units, both current and future, must then be placed within this structure, under the technology area(s). This approach recognizes that the work units are often technically related, and have a common goal. The following structure will accomodate our current and future work units, as we have been able to identify them to date. As we proceed with the re-direction of the NRRP, this structure may need refining.



### **Current Work Units**

The FY 90 NRRP Work Units, which will be discussed in detail tomorrow, are as follows:

- 32573 - Management and Technical Publications
- 32269 - Economic Impacts of Corps-Managed Recreation Areas
- 32574 - Regional Recreation Demand Model
- 32349 - Estimating Dispersed Recreation Use of Corps Lands
- 31544 - Research and Demonstration System
- 32503 - Natural Resource Management and Planning  
(Guidelines for Improving Operational Management Plans)

## Goals

Several of the following goals were presented at last year's meeting, and at the National NRM Conference in Nashville this February:

- a. Increase the field's knowledge of the NRRP.
- b. Improve the NRRP's credibility with the field.
- c. Broaden the field input into the NRRP development.
- d. Provide for project-level input to the NRRP.
- e. Refine the R&D system.
- f. Increase NRRP visibility with national technical groups.
- g. Increase contributions to professionally refereed journals.

In restating these, I would also like to progress toward these goals, where appropriate.

- a. *Increase the field's knowledge of the NRRP.* We need to increase the knowledge and awareness of the NRRP both in-house and outside the Corps. In the last year, we have improved our visibility **within** the Corps. We still have a long way to go. We have not improved our visibility and awareness at the project level, and to some degree, at the District level, and we can improve in those areas. We have made efforts to improve our visibility outside of the Corps through active support and participation in technical and university meetings. At this time we have succeeded in one or two areas, but I have no appropriate basis yet on which to judge overall progress in this area.
- b. *Improve the NRRP's credibility with the field.* We need to re-establish and improve our credibility with the field; the in-house users of our results. In the past, we have initiated some research efforts that were identified as necessary **for** the field, but not **requested by**, or identified as a need by the field. Also, we have initiated some efforts without a clear understanding of our goal and expectations. As a result, products were not on time, or were not what was expected.
- c. *Broaden the field input into the NRRP development.* We need to continue to identify and implement ways to broaden the base of field input to identifying research, and to streamline the process by which the input is submitted. Last year Judy attempted to reinstitute the fall meeting of the Field Review Group (FRG). For many reasons and through no fault of Judy's, the meeting did not materialize. I am recommending that we try it again this year. An interested and dedicated FRG can be very effective in influencing the research program's development and direction. As representatives of the "field," their role in providing this influence cannot be taken lightly.
- d. *Provide for project-level input to the NRRP.* Last year, I mentioned that the largest number of problems amenable to research are identified at the project and District levels. This is not to say that the Divisions don't have problems, but the problems at the upper level of our organization tend to relate more to policy and

regulations. To me, this variation in the perception of the problems is a function of how close to the "firing line" you stand. We need to provide more opportunity for input directly from the project level.

e. **Refine the R&D system.** We had planned to take a hard look at the R&D system during FY 89—we didn't accomplish this. We had several things "already on the table" that needed to be finished, that were of a more urgent nature. We still need the assurance that the R&D system is appropriately structured to serve current needs. We will try to initiate that process before the end of this fiscal year.

f. **Increase NRRP visibility with national technical groups.** At last year's meeting in Omaha, I stated that one of my long-range goals was to have the Corps' research program and the researchers recognized as national leaders in the technology within their areas of expertise. This goal has been, and will be, continually emphasized. Since last year's meeting, NRRP researchers were actively involved in the following:

Society of American Archeologists Annual Conference  
North American Wildlife and Natural Resources Conference  
National Military Fish and Wildlife Association Meeting  
Society of Wetland Scientists  
National Agronomy Society Meeting  
Outdoor Recreation Trends Symposium  
Southeastern Recreation Research Symposium  
Southwestern Social Science Association Conference

g. **Increase contributions to professional journals/proceedings.** During the last year, the following papers were submitted for publication in Proceedings:

"Factors Affecting Boating Satisfaction: A Replication and Comparative Analysis;" John Titre, et al.; *Proceedings, 1990 Northeastern Recreation Research Conference*.

"National Trends in Camper Characteristics at Corps of Engineer Lakes;" John Titre, Scott Jackson, et al.; *Proceedings, 1990 Outdoor Recreation Trends Symposium III*.

### FY 90 and Beyond; Things To Do

In 1988, I identified the following items to become a part of the strategy for redirection and development of the NRRP:

a. **Annual.**

(1) **Brief CECW-O and CECW-P on NRRP status.** Prior to the FY 88 meeting of the Corps' R&D Review Board, we briefed Mr. John Elmore, then C/Operations-Readiness Division, Headquarters, US Army Corps of Engineers (HQUSACE), and Mr. Dan Mauldin, then C/Planning Division, HQUSACE, on the status of the NRRP at that time, and the goals and plans for the future redirection. Prior to the FY 89 R&D Review Board meeting,

we briefed Mr. Elmore, C/Construction-Operations Readiness Division, HQUSACE, and Mr. Jimmy Bates, C/Planning-Policy Division, HQUSACE, on the previous year's progress and the future plans. We intend to conduct such a briefing this FY. Mr. Elmore and Mr. Bates are members of the R&D Review Board, and we are attempting to keep them better informed on the NRRP needs.

- (2) **Attend Division/District NRM meetings.** During the last 2 years, we have attended six Division/District meetings and have given presentations on the NRRP and the NRTS. Those who attended were:

- (a) North Central Division - September 1988.
- (b) Nashville District - November 1988.
- (c) Sacramento District - January 1989.
- (d) Missouri River Division - October 1989.
- (e) Ohio River Division - March 1990.
- (f) New England Division - April 1990.

Attending these meetings gives us the opportunity to provide the field elements with a current status of the NRRP and the NRTS activities. It provides them with the opportunity to identify problems for potential research items, as well as letting us know how well we are doing. To date we have not gotten the feedback on the latter two areas that I had hoped to obtain.

- (3) **Convene meeting of the NRRP FRG.** The FRG for any Corps research program is essential to the success of the research development and conduct. Actively involved FRG's assure successful research programs. The members of the FRG are intended to be and should function as the corporate Board of Directors representing the stockholders (the field elements). The field elements who need the results from the research should use the FRG to assure that the research takes the direction of current needs. The FRG must be responsible not only to the field, but also to the research program. This latter responsibility assures that the research has continuity, and serves the broader needs of the entire Corps, and moderated the tendency for precipitous decision making. While this year's FRG meeting did not materialize, it is essential that we convene this meeting this fall.
- (4) **Visit selected projects.** Two years ago, I planned to visit two projects each year, to observe the "real world" and to discuss the NRRP/NRTS with the project personnel and begin to solicit their input to the NRRP. I was not able to do this as I had planned. Several Divisions have offered the opportunity, and I intend to do at least one this summer.
- (5) **Institute an annual NRRP meeting.** Two years ago, I proposed to Darrell Lewis that we hold an "annual research meeting" and incorporate the CW R&D Program Review as part of this meeting. This would provide for a day of presentations and information exchange. Darrell agreed, and I obtained approval from the Research and Development Directorate (CERD-C) to hold the NRRP Program Review at a different Division location each

year in conjunction with such a meeting. Last year we held the first of these in Omaha, hosted by the Missouri River Division, and this year is our second, hosted by the South Atlantic Division.

As a product of this annual effort, I initiated the publication and distribution of annual proceedings. These proceedings will provide a record for all of us to carefully document our progress, plans, and needs. I welcome any comments about the value and/or the format of these proceedings.

- (6) **Distribute recommended R&D program.** This process will begin after tomorrow's review. Each year, I provide HQUSACE with my recommendations for the review year and future research program. After a reasonable time for them to respond, I intend to distribute copies of these recommendations to the Division and District NRM contacts, and the FRG members. I will include the input data received during the program review, and how it was considered. This will provide you with a perspective of the total Corps input as well as your respective organization's. I welcome any comments you may have.

b. **Biennial.**

- (1) **Attend NRM Conference.** This past February, we attended the National NRM Conference in Nashville, TN. A presentation was given on the NRRP status and a report of NRTS activities. In addition, hands-on demonstrations of the Automated Use Permit System (AUPS) and the Visitation Estimation and Reporting System (VERS) were conducted by US Army Engineer Waterways Experiment Station (WES) personnel. WES also provided poster sessions on the following topics:
  - (a) AUPS.
  - (b) Economic impact analysis.
  - (c) VERS.
  - (d) Boating capacity studies.
  - (e) Waterfowl management.
- (2) **Convene NRM Task Force.** This was not planned for FY 90, but should be accomplished before the 1991 annual meeting.

c. **Continual.**

- (1) **Categorize problems identified through NRTS responses.** For each of the last 2 years, we have categorized the nature of the NRTS requests. This year we will be writing a detailed report of NRTS activities for distribution to the field.
- (2) **Coordination with Technical Monitors.** We have put forth an increased effort to coordinate more frequently and efficiently with the Technical Monitors, Judy Rice and Bob Daniel. I think we are improving in this area. This is one communication area that is critical to the success of the application of research results.

## **Commitment To Customers**

With respect to both short- and long-term goals, a significant element of our potential to achieve them is communications. We must be committed to clear, timely, and proper communication with our customer. In order to be efficient and effective in this we must learn that commitments of work, time, money, progress, and product delivery for NRRP and NRTS can only officially be made through the NRRP Program Manager's office. We must keep the communication lines open between all levels, but we must be able to recognize that "contracts" cannot be entered into without the involvement of the proper channels.

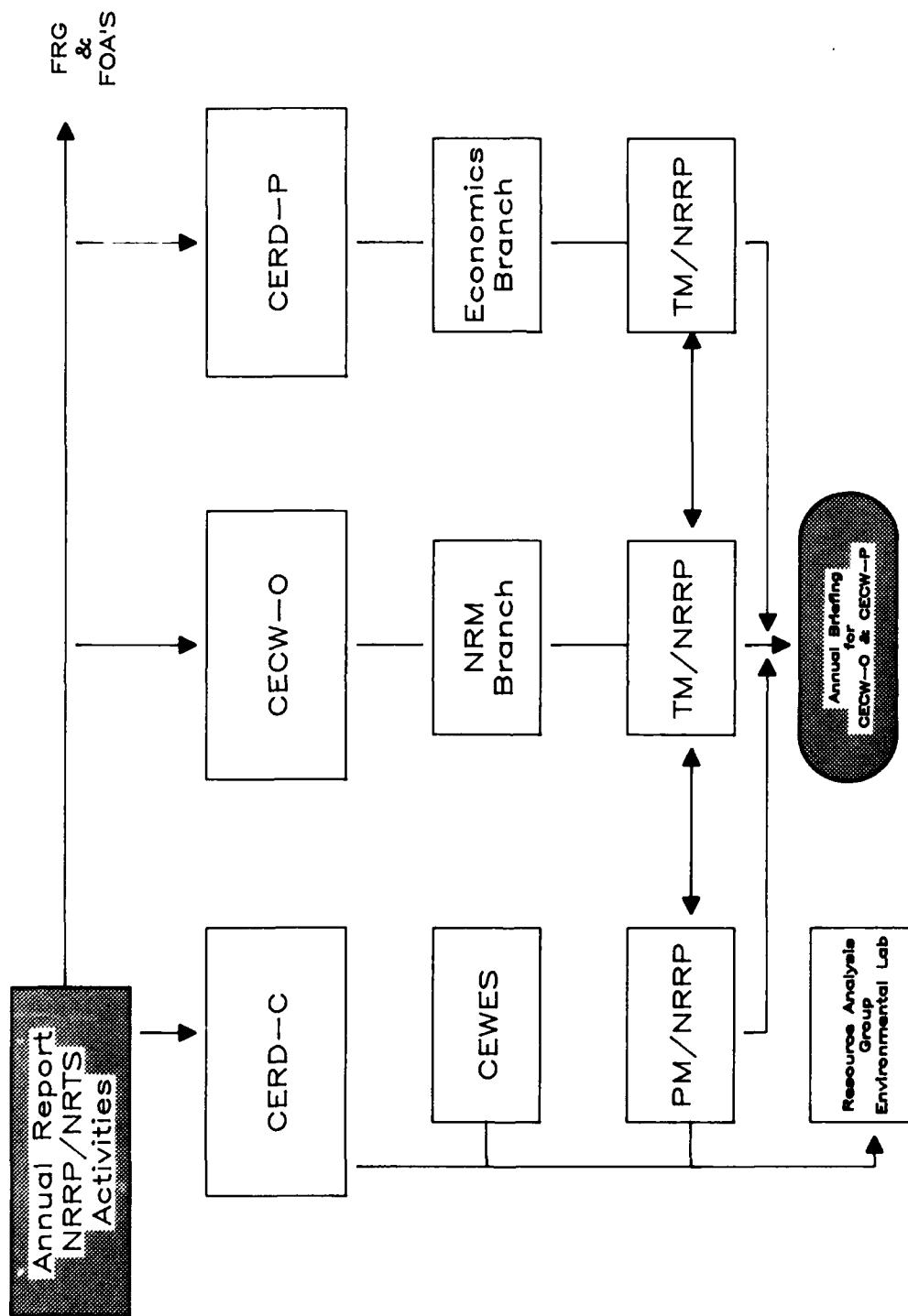
We must do a better job of understanding exactly what is expected of the research before initiating work. Once understood, we must plan an approach that assures successful completion, with quality and timeliness.

## **NRRP Strategy**

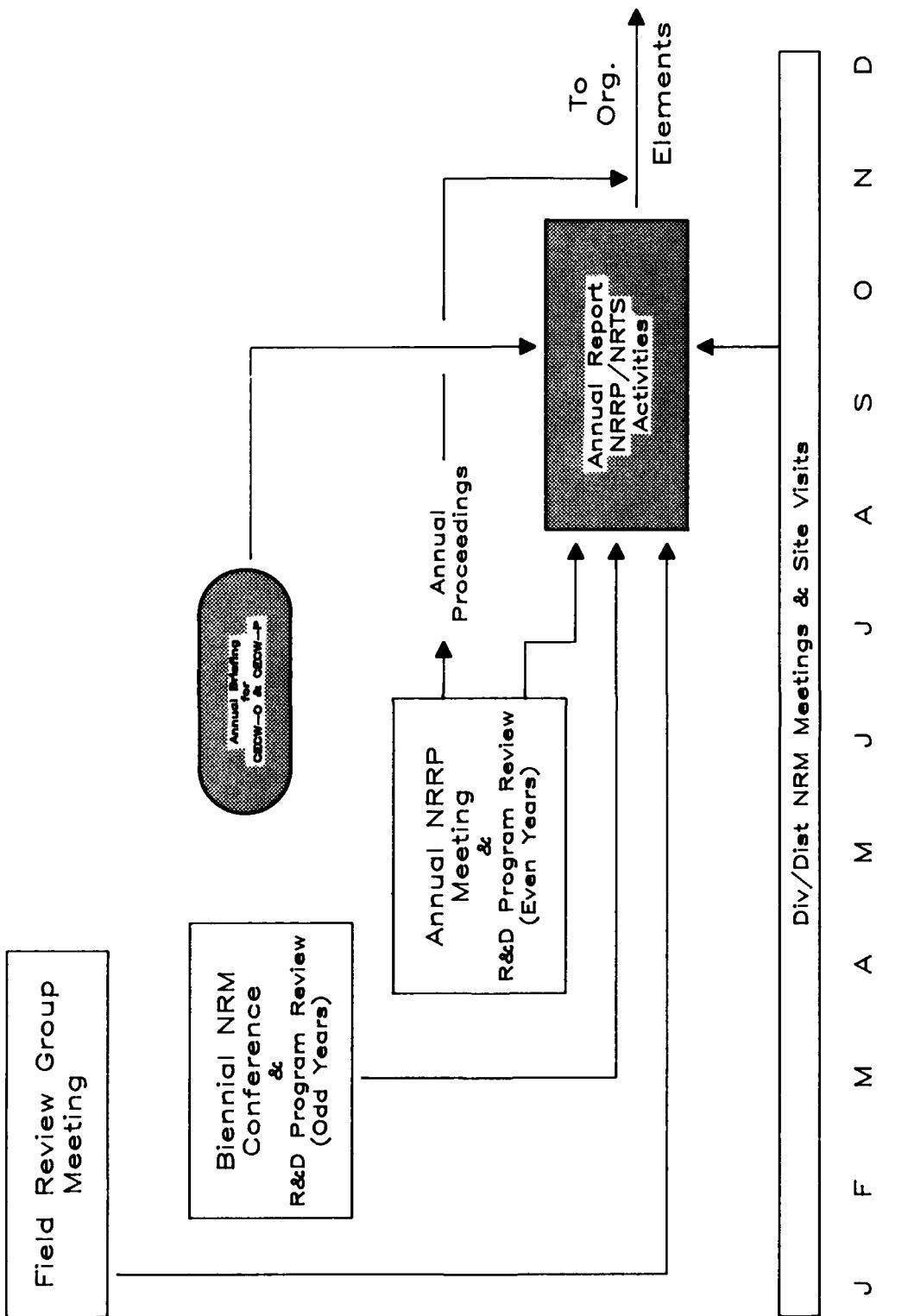
For the past year, I have been developing a strategy for accomplishing the goals of the research program. I am preparing a paper that sets down this strategy. Generally, the approach is to take better advantage of the existing organizational elements and activities, to achieve the overall goals and goals of the redirected NRRP. To date, I have a draft that explains how the existing organizations and activities might be utilized. The next step is to incorporate new and innovative activities that can be instituted to provide improved communications and interactions between the research and operational elements. These would add to and/or replace any existing elements. In the next few months, I will be including additional details and asking for comments and ideas from the field.

Figure 1 shows the organizational elements that are involved—both research and operational. The strategy discusses these organizations' respective functional roles, and relationships, and how they can contribute to a more visible, productive research program. Figure 2 shows the existing activities that routinely take place, that can be utilized to establish improved communications with each other.

Overall, we have made improvements in only a few areas of the NRRP. We have, however, put ourselves into a position to make very significant improvements during the next year or two. The final goal, as stated in Omaha in 1989, is to have the field recognize the NRRP as theirs!



*Figure 1. Organizational elements in NRM/NRRP*



*Figure 2. NRM/NRRP activities*

# **NATURAL RESOURCES TECHNICAL SUPPORT PROGRAM**

## **ENVIRONMENTAL RESOURCES RESEARCH AND ASSISTANCE PROGRAMS**

by

J. Lewis Decell, Manager

### **Objective**

The Natural Resources Technical Support (NRTS) Program is an Operations and Maintenance funded program whose objective is to rapidly transfer and apply technology developed through the Natural Resources Research Program (NRRP), and other readily available sources, to problems existing at Corps operating projects. The NRTS consists of four major functions; direct assistance, technology transfer, technology maintenance, and special projects.

### **Direct Assistance**

The NRTS provides direct technical assistance, upon request, to field elements having problems on Corps operating projects. Any Corps element can request assistance from NRTS, as outlined in Figure 1. During FY 89, NRTS responded to 36 requests from 13 Districts in 7 Divisions, and Headquarters, US Army Corps of Engineers (HQUSACE). These requests involved over 20 Corps projects. A representative list of the types of problems addressed is as follows:

Automated Use Permit System	Visitation surveys
Economic impacts	Low-maintenance vegetation
Natural Resource Management System	Wildlife management
Cultural resources management	Geographic information systems
Waterfowl management	Lake carrying capacity
Mosquito control	Cost-tracking system
Zip code analysis	Fisheries management

Figure 2 shows the distribution of NRTS requests by Corps Divisions for FY 89, and Figure 3 shows the distribution of the 102 NRTS requests received since the program started in FY 87.

### **Technology Transfer**

In addition to direct assistance, NRTS provides additional forms of technology transfer. Specific examples of this function of the program are the publication and distribution of the NRRP information exchange bulletin *RECNOTES*, participation in Division and District Natural Resource Management (NRM) meetings, technical assistance for CECW-ON committee activities, and the conduct of workshops.

## **Natural Resources Technical Support Program**

### **NRTS**

The NRTS Program was initiated in FY 87 to provide rapid technical assistance for field problems associated with recreation and natural resources management in the Corps of Engineers. The program is an Operations and Maintenance (O&M) funded program. Assistance is limited to Corps activities associated with operating O&M projects, problems existing during the planning or engineering phases of renovations, or alterations to operating O&M projects.

To request assistance, a letter to the Manager of the NRTS Program at the following address is required:

Commander and Director  
USAE Waterways Experiment Station  
ATTN: Mr. J. L. Decell, CEWES-EP-L  
3909 Halls Ferry Road  
Vicksburg, MS 39180-6199

In the request you should name the project, state the nature of the problem, and the type of assistance required. If you have been in contact with a technical person at WES who has knowledge of your problem, you may request that individual by name. The request should identify a point of contact in your organization and a telephone number. Upon receipt of your letter, the request will be directed to the proper technical staff member at WES for response.

Assistance under NRTS is provided at no cost to the user and is limited to 7 man-days, including travel. The results of the assistance provided will be formally transmitted to your organization by the Manager, NRTS. In cases where assistance is needed very rapidly, telephone requests are honored, but must be followed up by a letter. When the results are needed rapidly, advance copies are forwarded by FAX and followed up with a formal response.

In addition to this **Direct Assistance** to the FOAs, NRTS activities also include **Technology Transfer**, such as workshops, and the publication and distribution of **RECNOTES**, an information exchange bulletin. **Technology maintenance** is also a NRTS function; it assures that the direct assistance provided is state of the art.

*Figure 1. Procedure for requesting assistance from NRTS*

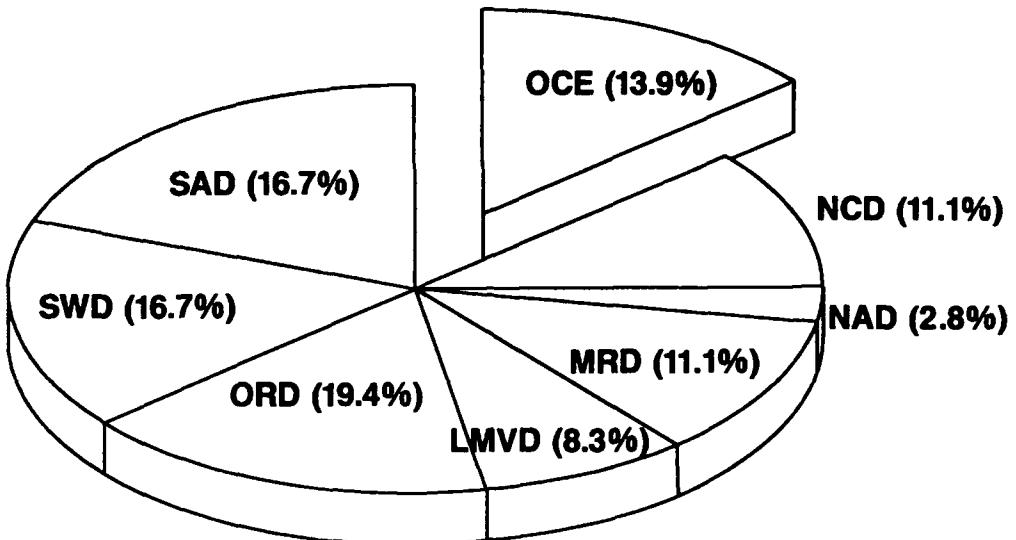


Figure 2. NRTS requests by Division, FY 89

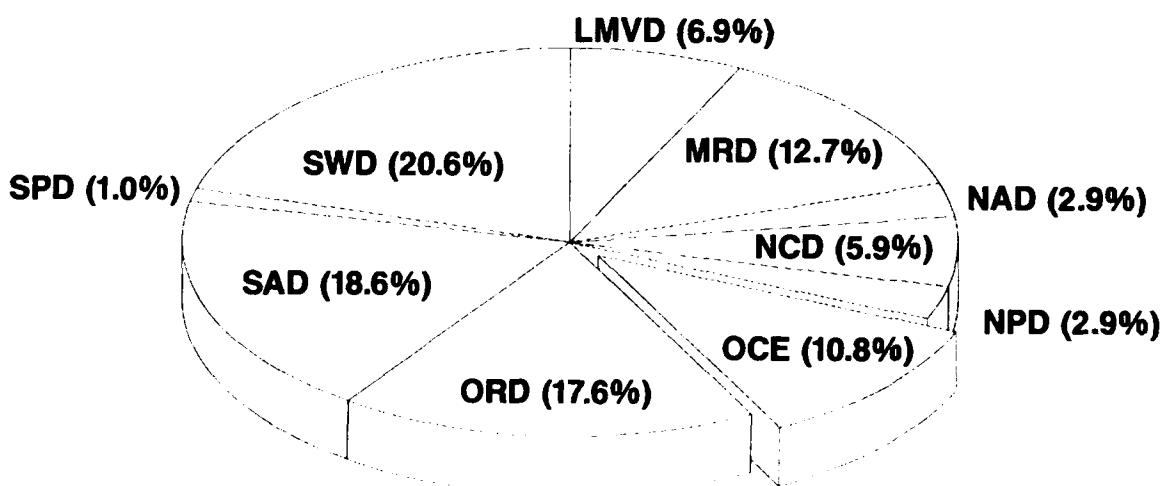


Figure 3. NRTS requests by Division, FY 87, 88, 89

We are incorporating the Chief's Corner articles in the *RECNOTES* and are currently generating an in-house list of potential articles that can be scheduled.

We have held seven workshops in FY 90 for the Automated Use Permit System (AUPS), a workshop on Improving Operational Management Plans, and a PROSPECT course on Visitation Surveys. Workshops on visitation survey procedures in response to field interest are being planned.

We will continue to solicit invitations to attend District and Division NRM meetings to present NRTS activities.

### **Technology Maintenance**

In 1989, AUPS was significantly enhanced based on comments received and data collected during the 1988 field tests. When the Corps-wide implementation of AUPS was initiated, it was agreed, with HQUSACE, that no changes would be made to the AUPS, except those that were identified and approved from the 1989 tests. Additional comments are being received, and these will be reviewed at the close of FY 90, and our recommendations for any additional changes will be presented to HQUSACE, prior to the 1991 season.

The AUPS is generating a significant amount of very valuable data. The value of this data lies in performing timely analyses that place the data in a form useable to the field and HQUSACE. We need to initiate planning to accommodate this part of AUPS, and implement analytical procedures to produce the information in a timely manner. We should take advantage of the Nashville District's experience with AUPS, and initiate the planning.

### **Special Projects**

The NRTS special projects, because of their nature, are not research, but require technical attention to facilitate their operational applications. Two such projects are conducted under NRTS; the Corps-wide implementation of the AUPS, and the Economic Impact Performance Indicator (EIP) effort being conducted for HQUSACE. Part of the EIP effort is the collection of visitor expenditures. Surveys were conducted in FY 89 at the following projects:

J. Percy Priest  
Mendocino  
Raystown

McNary  
Oahe  
Shelbyville

We are in the process of selecting projects for the FY 90 surveys. Projects tentatively selected for FY 90 are:

Cumberland  
Fern Ridge  
Milford

Dworshak  
Lanier  
Ouchita

As both accurate estimates of visitor expenditures and correct visitation figures are essential in the establishment of reliable economic impact performance indicators, the

US Army Engineer Waterways Experiment Station, in FY 91, will be providing instructional workshops on visitation estimation and reporting systems, using a direct data entry system.

### **Conclusion**

The NRTS will continue to emphasize technology transfer through direct FOA assistance to solve problems at operational projects. Technology transfer activities will include publication and distribution of the *RECNOTES*, conduct of workshops, and participation in Division/District meetings. Corps-wide implementation of the AUPS will continue with appropriate changes in response to field needs.

# FY 91 NATURAL RESOURCES RESEARCH PROGRAM

## NATURAL RESOURCES BREAKOUT SESSION

### Introduction

Division, District, and project Natural Resources personnel met for a breakout session on the afternoon of April 16, 1990, to discuss the FY 91 Natural Resources Research Program (NRRP). Technical Monitor Judith Rice proposed the group use the limited time available to focus on (a) current concerns with the NRRP, and (b) new proposed work units. Gerald Purvis served as the facilitator for discussion. Bill Irwin served as recorder and reported the group's conclusions to the full program review group following the breakout.

### Current Concerns

The group felt that useful, high-quality products are being developed from the research team. After a brain-storming session aimed at getting ideas to improve the program, the group concentrated discussion on the following topics:

- a. ***Work unit titles.*** There has been some confusion in the past over work unit titles. Titles should be consistent with and appropriate for the description of work. After an appropriate title has been selected, titles should not change in subsequent years, without full coordination and notification.
- b. ***Accountability for reimbursable work and Natural Resources Technical Support (NRTS) assistance.*** Natural resources offices receiving reimbursable research work and NRTS assistance should be accountable for providing feedback to researchers. It was recommended that a form be provided with each product so that field personnel have a built-in process for providing these comments.
- c. ***Policy versus research.*** The group felt that with the shortage of staff in Headquarters (HQ), Natural Resources, field personnel were looking to the US Army Engineer Waterways Experiment Station (WES) to provide policy support. WES should be sensitive to this situation and make an effort to differentiate between research and policy needs. As an example, the group felt that it would be inappropriate for a WES-organized task force to work on Operational Management Plan policies.
- d. ***Information transfer.***
  - (1) ***RECNOTES.*** The widely circulated *RECNOTES* publication is a useful vehicle for presenting research-related updates to the field. Credibility is lost when *RECNOTES* is published sporadically. The WES should set up a quarterly publishing schedule. The contents should be a mixture of research and operations material. *RECNOTES* contents and frequency of publishing should be evaluated at future annual research review meetings.
  - (2) Annual summaries of NRTS and Reimbursable Research work should be provided to the field. The products of regional and project-specific

research could be useful at other locations. Without a summary, field personnel have no way of knowing what work has been accomplished.

- e. ***Dropping work units.*** The group felt that a process needs to be implemented for dropping work units when (1) enough research has been provided, (2) research is obsolete, and/or (3) research dollars could be better spent elsewhere.
- f. ***Submission of research ideas.*** The group agreed that the process for nominating ideas for research is not working.
  - (1) The list of field review group members should be reevaluated, updated, and distributed.
  - (2) RECNOTES should include a basic short form that allows for research ideas to be submitted to field group review members.
  - (3) HQ Natural Resources and WES personnel should discuss ways of improving the process for submitting research nominations and make this process clear to employees.

### **New Work Units**

In the future, breakout groups should convene after WES employees have given their new work unit presentations. It is recommended that on the form used to tabulate votes a fourth column should be added to allow for voting to kill a work unit. With little time, and since presentations had not been given on the work units, breakout discussion was limited to questions about each work unit.

- a. ***Management of water-based recreation opportunities.*** Why is this research projected to last through FY 94? Why not have 1 year of intensive research? Can a meaningful product that will be useful to managers be produced? Will the research also study implementation methods?
- b. ***Improving accuracy, efficiency, and utility of the Natural Resource Management System (NRMS).*** Is this a research item or does this work belong in HQ? Will monthly visitation updates be required, and should they be automatically uploaded to the NRMS?
- c. ***Operations and Maintenance System.*** Is this proposed work unit research or literature review? Is this cost tracking that we are already doing?
- d. ***Survey of waterfowl management practices at Corps projects.*** Why is this research projected to be so costly? Is this research needed, or would technical management advice be more useful? With the current Corps policy toward implementing new wildlife management programs that may be considered enhancement, is it appropriate to review practices that would require cost sharing?
- e. ***Multiple species management on Corps project lands.*** Is this type of research already available elsewhere?

- f. *Expert systems for Natural Resource Management.* What are "expert systems?" Why is it projected to cost so much to review applications of the systems to the Corps' natural resources program? What will the end product be?
- g. *Evaluating the effectiveness of signing for protection of archaeological sites.* Is this type of research available from the Department of the Interior? Could the cost of research be shared with other agencies that may find the results useful?
- h. *Measuring the effects of alternative recreation fee programs.* Will research cross over into policy issues?

The group considered the breakout session to be very valuable and recommended it be expanded in next year's program review.

**FY 91 CIVIL WORKS RESEARCH  
AND DEVELOPMENT PROGRAM REVIEW**

**NATURAL RESOURCES RESEARCH PROGRAM**

**NATURAL RESOURCES RESEARCH PROGRAM  
CIVIL WORKS R&D PROGRAM REVIEW**

**ATTENDEE LIST**

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## **FIELD EVALUATIONS**

An evaluation form was used to record the input from the program review attendees. This form was also made available to those Natural Resource Research Program District Points of Contact and Field Review Group (FRG) members that were not present so their input could be obtained. This form provided a method of sorting out the interests of the users for current and future research, while assuring continuity of the research program.

For purposes of resolving the input into some usable form to aid in the establishment of priorities, the High-Medium-Low categories were assigned a value of 3-2-1, respectively. The results were then placed in a matrix form that contained each existing and proposed work unit and their respective quantitative values. A total and a mean are calculated to serve as "relative interest values."

FY91 NATURAL RESOURCES RESEARCH PROGRAM REVIEW

CURRENT WORK UNITS	LMD*	MRD	NED	NAD	NCD	NPD	ORD*	SAD	SPD	SWD	DIV/FRG TOTAL		AVE	RANK
											DIV	FRG		
32269 ECONOMIC IMPACTS OF CE MANAGED RECREATION AREAS	3	3	3	3	3	3	3	3	3	3	3	30	3.0	1
32319 ESTIMATING DISPERSED RECREATION USE OF CE LANDS	2	3	3	3	3	3	3	3	3	3	1	27	2.7	2
32573 MANAGEMENT AND TECHNICAL PUBLICATIONS	3	3	2	1	3	3	2	3	3	3	1	24	2.4	3
31544 RESEARCH AND DEMONSTRATION SYSTEM	3	3	2	2	2	2	2	2	2	3	2	24	2.4	4
32574 REGIONAL RECREATION DEMAND MODEL	1	3	1	2	3	2	2	3	3	1	1	21	2.1	5
32503 GUIDELINES FOR IMPROVING OMP's	1	0	1	3	1	1	2	0	1	1	1	11	1.1	6
PROPOSED WORK UNITS														
375-3 IMPROVING THE ACCURACY, EFFICIENCY AND UTILITY OF NRMS	3	3	3	3	3	1	3	3	3	3	3	28	2.8	1
375-2 MANAGEMENT OF WATER-BASED RECREATION OPPORTUNITIES	2	3	3	3	3	2	3	3	3	2	2	27	2.7	2
375-5 MEASURING THE EFFECTS OF ALTERNATIVE REC FEE PROGRAMS	2	3	3	3	3	1	3	2	3	2	1	24	2.4	3
375-6 SURVEY OF WATERFOWL MANAGEMENT PRACTICES AT CE PROJECTS	3	2	2	2	2	1	1	0	1	1	1	15	1.5	4
375-4 OPERATIONS AND MAINTENANCE SYSTEM	1	2	2	2	2	1	1	0	1	1	2	14	1.4	5
375-7 EXPERT SYSTEMS FOR NATURAL RESOURCES MANAGEMENT	1	1	2	2	1	1	2	2	1	1	1	14	1.4	6
375-9 MULTIPLE SPECIES MANAGEMENT ON CE PROJECT LANDS	2	1	1	1	1	1	1	1	1	2	1	11	1.1	7
375-8 EVALUATING THE EFFECTIVENESS OF SIGNING FOR PROTECTION OF ARCHAEOLOGICAL SITES	1	2	1	1	2	1	1	0	1	1	1	11	1.1	8

\* FRG Members not present at Program Review

FY91 NATURAL RESOURCES RESEARCH PROGRAM REVIEW

CURRENT WORK UNITS	MARK	NCS	NPP*	NPS*	SAJ	SAM	SAW*	SPK*	TOTAL	AVE	DIST	RANK
32269 ECONOMIC IMPACTS OF CE MANAGED RECREATION AREAS	3	3	3	3	3	3	3	3	24	3.0	1	
32573 MANAGEMENT AND TECHNICAL PUBLICATIONS	3	2	3	3	2	3	2	3	21	2.6	2	
32349 ESTIMATING DISPERSED RECREATION USE OF CE LANDS	3	3	2	3	3	2	3	1	20	2.5	3	
31544 RESEARCH AND DEMONSTRATION SYSTEM	2	2	2	2	2	2	1	2	15	1.9	4	
32574 REGIONAL RECREATION DEMAND MODEL	1	3	3	2	1	1	1	1	2	1.4	5	
32503 GUIDELINES FOR IMPROVING OMPs	3	1	1	3	1	0	2	2	13	1.6	6	
PROPOSED WORK UNITS												
375-2 MANAGEMENT OF WATER-BASED RECREATION OPPORTUNITIES	2	3	3	3	3	3	3	3	23	2.9	1	
375-3 IMPROVING THE ACCURACY, EFFICIENCY AND UTILITY OF NRMS	3	3	2	1	3	1	2	2	17	2.1	2	
375-5 MEASURING THE EFFECTS OF ALTERNATIVE REC FEE PROGRAMS	3	2	2	3	1	2	2	1	16	2.0	3	
375-4 OPERATIONS AND MAINTENANCE SYSTEM	2	2	2	3	1	0	3	2	15	1.9	4	
375-6 SURVEY OF WATERFOWL MANAGEMENT PRACTICES AT CE PROJECTS	1	2	1	1	1	1	3	1	12	1.5	5/6	
375-9 MULTIPLE SPECIES MANAGEMENT ON CE PROJECT LANDS	2	1	1	3	1	1	1	2	12	1.5	5/6	
375-7 EXPERT SYSTEMS FOR NATURAL RESOURCES MANAGEMENT	1	1	1	3	1	0	2	1	10	1.3	7	
375-8 EVALUATING THE EFFECTIVENESS OF SIGNING FOR PROTECTION OF ARCHAEOLOGICAL SITES	1	1	2	1	1	0	2	1	9	1.1	8	

\*Not present at Program Review

FY91 NATURAL RESOURCES RESEARCH PROGRAM REVIEW

CURRENT WORK UNITS	SAM	SAM	SAS	SAS	PROJ	TOTAL	AVE	RANK
	FO-AI	FO-SI	OP-CL	OP-RL				
<b>CURRENT WORK UNITS</b>								
32269 ECONOMIC IMPACTS OF CE MANAGED RECREATION AREAS	3	2	2	3	10	2.5	1	
32573 MANAGEMENT AND TECHNICAL PUBLICATIONS	2	2	3	9	2.3	2 / 3		
32349 ESTIMATING DISPERSED RECREATION USE OF CE LANDS	2	3	2	2	9	2.3	2 / 3	
31544 RESEARCH AND DEMONSTRATION SYSTEM	2	2	2	2	8	2.0	4	
32574 REGIONAL RECREATION DEMAND MODEL	2	3	1	1	7	1.6	5	
32503 GUIDELINES FOR IMPROVING OMPs	0	0	0	1	1	0.3	6	
<b>PROPOSED WORK UNITS</b>								
<b>PROPOSED WORK UNITS</b>								
375-2 MANAGEMENT OF WATER-BASED RECREATION OPPORTUNITIES	3	3	2	3	11	2.8	1	
375-5 MEASURING THE EFFECTS OF ALTERNATIVE REC FEE PROGRAMS	2	1	2	2	7	1.6	2	
375-3 IMPROVING THE ACCURACY, EFFICIENCY AND UTILITY OF NRMS	2	1	1	2	6	1.5	3	
375-6 SURVEY OF WATERFOWL MANAGEMENT PRACTICES AT CE PROJECTS	1	0	0	1	2	0.5	4 / 7	
375-4 OPERATIONS AND MAINTENANCE SYSTEM	0	1	0	1	2	0.5	4 / 7	
375-7 EXPERT SYSTEMS FOR NATURAL RESOURCES MANAGEMENT	0	0	1	1	2	0.5	4 / 7	
375-8 EVALUATING THE EFFECTIVENESS OF SIGNING FOR PROTECTION OF ARCHAEOLOGICAL SITES	1	0	0	1	2	0.5	4 / 7	
375-9 MULTIPLE SPECIES MANAGEMENT ON CE PROJECT LANDS	0	0	1	1	1	0.3	8	

FY91 NATURAL RESOURCES RESEARCH PROGRAM REVIEW

CURRENT WORK UNITS	DIV/FRG		DISTRICT		PROJECT		TOTAL INPUT	
		TOTAL MEAN RANK		TOTAL MEAN RANK		TOTAL MEAN RANK		TOTAL MEAN RANK
32269 ECONOMIC IMPACTS OF CE MANAGED RECREATION AREAS	30	3.0	1	2.4	3.0	1	1.0	2.5
32349 ESTIMATING DISPERSED RECREATION USE OF CE LANDS	27	2.7	2	2.0	2.5	3	9	2.3
32573 MANAGEMENT AND TECHNICAL PUBLICATIONS	24	2.4	3	2.1	2.6	2	9	2.3
31544 RESEARCH AND DEMONSTRATION SYSTEM	24	2.4	4	1.5	1.9	4	8	2.0
32574 REGIONAL RECREATION DEMAND MODEL	21	2.1	5	1.4	1.8	5	7	1.8
32503 GUIDELINES FOR IMPROVING QMPS	11	1.1	6	1.3	1.6	6	1	0.3
							6	1.2

PROPOSED WORK UNITS	DIV/FRG		DISTRICT		PROJECT		TOTAL INPUT	
		TOTAL MEAN RANK		TOTAL MEAN RANK		TOTAL MEAN RANK		TOTAL MEAN RANK
375-3 IMPROVING THE ACCURACY, EFFICIENCY AND UTILITY OF NRMS	28	2.8	1	17	2.1	2	6	1.5
375-2 MANAGEMENT OF WATER-BASED RECREATION OPPORTUNITIES	27	2.7	2	23	2.9	1	11	2.8
375-5 MEASURING THE EFFECTS OF ALTERNATIVE REC FEE PROGRAMS	24	2.4	3	16	2.0	3	7	1.8
375-6 SURVEY OF WATERFOWL MANAGEMENT PRACTICES AT CE PROJECTS	15	1.5	4	12	1.5	5/6	2	0.5
375-4 OPERATIONS AND MAINTENANCE SYSTEM	14	1.4	5	15	1.9	4	2	4/7
375-7 EXPERT SYSTEMS FOR NATURAL RESOURCES MANAGEMENT	14	1.4	6	10	1.3	7	2	0.5
375-9 MULTIPLE SPECIES MANAGEMENT ON CE PROJECT LANDS	11	1.1	7	12	1.5	5/6	2	0.5
375-8 EVALUATING THE EFFECTIVENESS OF SIGNING FOR PROTECTION OF ARCHAEOLOGICAL SITES	11	1.1	8	9	1.1	8	1	0.3
							8	2.2

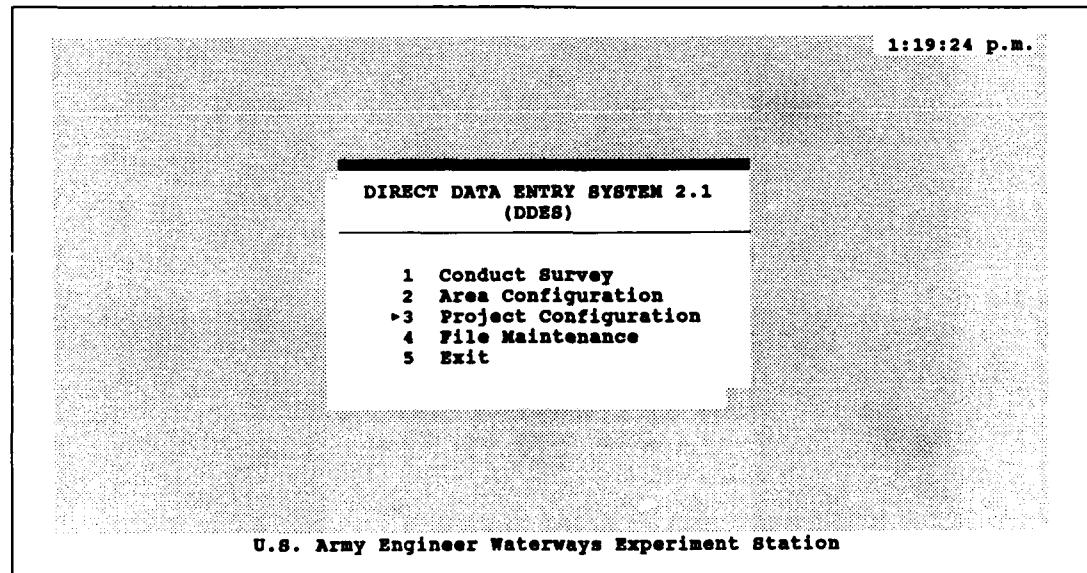
## TRAFFIC-STOP SURVEYS DIRECT DATA ENTRY SYSTEM (DDES)

by  
Kathleen Perales\*

The Traffic-Stop Surveys Direct Data Entry System (DDES) will be available for distribution in June of 1990. The system is designed to allow traffic-stop survey information to be entered into a computer at the time of the interview. The program directs the flow of logic for the interview based on the responses entered, ensuring the questions are asked and answered in the proper order. The DDES also checks for range errors; for example, if there were two people in a car and the interviewer tried to enter three people hiking, the program would signal a mistake and ask the interviewer to code an entry within the range of possible entries, 0-2. By processing data in this way, logic and range errors can be detected at the time of the survey and eliminated.

The DDES will eliminate the need for keypunching and edit checking since the information is being entered to computer and the edit checks are built into the system. The laborious cycle of running the edit program on the data file, correcting data entry and keypunch mistakes, and rerunning the program is gone. The cost savings associated with editing the data will more than justify the costs of the portable computer required for data collection.

The survey program is divided into four component parts: the project configuration, the area configuration, the survey itself, and file maintenance (Figure 1). The project coordinator who was responsible for the development of the survey plan (the document which directs when and where surveys are to be conducted) will be required to enter the information



*Figure 1. Main menu of DDES*

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\* US Army Engineer Waterways Experiment Station, Vicksburg, MS.

in the project configuration component of the DDES (Figure 2). Much of the information required in the project configuration will come from the survey plan. The project manager will decide which questions are appropriate for each of the survey seasons, affecting all surveys for the project.

1:19:54 p.m.

**Project Configuration Screen**

**Project Name:** GOODTIME LAKE  
**Project NRMS#** 12345

**Activities for: Summer**

Available	Selected	User Options
Cross country skiing	Hiking	VISITOR CENTER
Hiking	ORV riding	BASEBALL FIELDS
Hunting	Other overnight	
Ice fishing	Swimming	
ORV riding	Visit marina	
Other overnight	Waterskiing	
Snowmobiling		
Swimming		
Visit marina		

**==>**

**↓↓ Move cursor →→ Delete mode ←← Add F2- Change season F10- Done**

*Figure 2. Project configuration screen of DDES*

The area configuration may be performed by the project coordinator or the contractor/surveyor. All of the information required will come directly from the project survey plan. No decision-making is required, it is only a matter of recording the information identified in the survey plan into the computer. Information requirements at this level include the number of Natural Resources Management System recreation areas behind the traffic meter being calibrated; the type of meter; the direction of traffic across the meter, etc. (Figure 3).

1:21:02 p.m.

**Area Configuration Screen**

**File Name:** 2OAKPARK  
**Survey Site Name:** OAK PARK EAST METER

**Number of NRMS Areas behind this meter:** 1

Area name	Num
OAK PARK	003

**Season:** Summer  
**Meter Type:** Pneumatic hose  
**Direction of Traffic:** Two way  
**Monday date:** 6/10/91

**Enter monday date and press ←**

*Figure 3. Area configuration screen of DDES*

The third component of the DDES is the actual survey. In this portion, the surveyor enters the system, selects the file required (developed in the area configuration) verifies it is the file required, and begins interviewing (Figure 4). The paper form had limitations on the field width and activities, not all activities allowed for double-digit entry (greater than nine people in the car) and not all activities asked at the project level were repeated for the area level use. These problems that existed on the paper version of the traffic-stop survey (ENG 4835) have been eliminated. Once the interview is completed, the surveyor will be able to review selected entries from the interview (Figure 5). The program will allow the interviewer to recall information at key locations throughout the survey to allow a personal edit of the data.

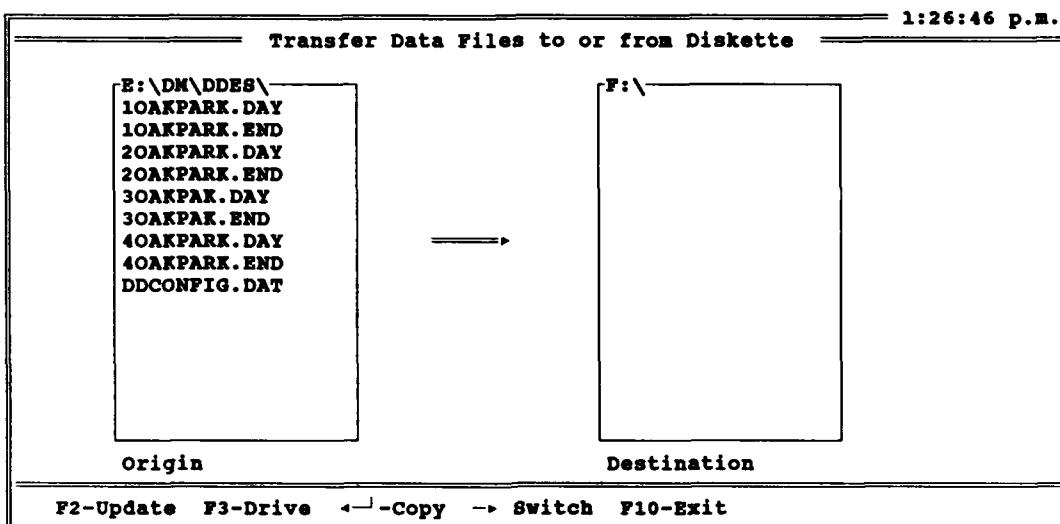
HEADER DATA		1:22:48 p.m.
PROJECT NAME: GOODTIME LAKE	PROJECT NRMS NO.: 12345	
AREA NAME: OAK PARK	AREA NRMS NO.: 003	
WEEKDAY SURVEY	SITE NAME: OAK PARK EAST METER	
MONDAY DATE: 6/10/1991	SEASON: Summer	
METER TYPE: Pneumatic hose	TRAFFIC: Two way	
SEASONAL QUESTIONS ASKED: ORV Riding, Visit Marina, Waterskiing, Swimming, Hiking		
OTHER ACTIVITIES: VISITOR CENTER, BASEBALL FIELDS		
ASK OTHER OVERNIGHT: YES	# OF AREAS BEHIND METER: 1	
Is this the correct file? Y/N Enter 'Y' to begin survey, 'N' to select another file		

*Figure 4. File selection for survey entry*

Thank you --- Review #3		1:40:05 p.m.
Recreation Vehicle: Yes		
Return to Project: No		
People in Vehicle: 3		
Overnight Use at Area: Yes		
Camping at Project: Yes		
Camping at Area: Yes		
Number of Nights: 4		
Only Area Visited: No		
Project Primary Destination: Yes		
Is this interview information correct? Yes		

*Figure 5. Sample interview review screen using DDES*

Because one user does not necessarily set up the project and area configuration and conduct the interview, it is necessary that the program allow for file transfer. The file maintenance menu option (the fourth component) is designed to assist the user in copying files from disk to disk (Figure 6).



*Figure 6. File maintenance options*

The only requirement for receiving the program is training. The people attending workshops will receive training on: application of the traffic-stop survey, meter location, survey site selection, survey plan development, for proper application of the DDES. In addition, training on file naming, file maintenance, and procedures in data collection will be involved.

# **ESTIMATING DISPERSED RECREATION USE AT JOHN H. KERR RESERVOIR**

by  
**Kathy King Mengak\*** and **Kathleen Perales\*\***

## **Introduction**

In order to make informed planning and management decisions, resource managers need accurate information regarding the amount, type, and distribution of recreation use at their projects. This information is often essential for determining such things as facility and road construction, redistribution of use pressures, and allocation of personnel and money. In addition, Federal and State agencies are placing more emphasis on obtaining accurate visitation figures from their sites.

While techniques exist to estimate recreation use at developed recreation areas where use is concentrated and access is limited, few techniques concentrate on dispersed recreation settings with multiple access points. Most of the techniques employed in dispersed use settings have identified visitors as they enter a roadway (Cushwa and McGinnes 1963), a trailhead (Lucas, Schreuder, and James 1971; Leatherberry and Lime 1980), a launch site (James, Wingle, and Griggs 1971), or as they pass a given segment of waterway (Marnell 1977). In these dispersed-use settings, access to the resource could be controlled. In some dispersed-use settings such as lake projects, access is not limited to well-defined accesses; it is usually characterized by a noncontiguous use of a narrow band of shoreline around a body of water and small parcels of land managed for low-density recreation or wildlife. Also, once access to these lands is obtained, recreation use is not limited to these areas, since use can extend to the water resource.

The purpose of this paper is to outline the vehicle access survey procedure; it was developed to estimate visitation at Corps of Engineers dispersed recreation settings with multiple access points where the use of traffic counters is not practical. The test site for this procedure was John H. Kerr Reservoir, which is located in the piedmont region along the border of Virginia and North Carolina. The project encompasses approximately 100,000 acres ( $404,687,300 \text{ m}^2$ ) of land and water and supports significant levels of dispersed recreation use.

## **Methods**

In studying the dispersed-use setting with multiple access points and fluctuating use patterns, it became readily apparent that covering all possible access points or trying to locate recreators in the field would be extremely difficult. Therefore, it was decided that finding the recreators parked vehicle would be the most reasonable means of identifying use in an area. It was proposed that a combination of mail-back surveys placed on the

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recreator's vehicle and car counts be used. Returned surveys would provide information on the number of people per vehicle, visitor's length of stay, type of recreational pursuits, and other information of interest. The vehicle counts performed by surveyors would provide the total number of vehicles in an area during a specified time. Visitation figures could be generated by correlating these two sources of information and then expanding the estimate to the entire area. The six-step procedure used at John H. Kerr Reservoir to accomplish this task is briefly described below:

- a. ***Defining the dispersed-use season.*** Since the amount and type of dispersed recreation use differs throughout the year, the first step is for knowledgeable project personnel to group significant use patterns into "seasons." At Kerr, these seasons were based on the times of the year where hunting and fishing on dispersed lands and access to the lake were considered significant.
- b. ***Designating the dispersed-use areas and mapping the road network.*** The second step is to identify on a map all dispersed-use areas that are not presently monitored by techniques such as traffic counters. The extensive roadwork that often traverses these areas also needs to be included on the map. The map should also contain checkpoints where visitor's cars are characteristically parked.
- c. ***Preparing a sampling plan.*** The sampling plan involves dividing the dispersed use areas into units of land that can be patrolled by surveyors during a specified period of time (e.g., 1 to 2 hr). Sample units are randomly selected from all possible days that are stratified into matrices. These matrices are based on strata of concern to the researcher and manager and at Kerr included such things as day of the week, hunting and fishing schedules, and times of the year. The number of sample units selected from each matrix or strata were determined by an optimal allocation process. A total of 10 blocks of land were established to ensure that all roads and jeep trails could be accessed in a 2-hr time frame.
- d. ***Conducting the survey.*** A survey was developed containing necessary questions such as length of stay and number of persons per vehicle in addition to questions of interest to the resource manager. On the specified day, surveyors drove through the designated areas on a continuous and regular basis from sunrise to sunset completing a round of the area in about 2 hr. Mail-back surveys were attached to parked vehicles and observational information was taken by the surveyors.
- e. ***Analyzing the data.*** Survey and observational data were entered into a database management system and analyzed using a computer package called the Statistical Analysis Package (SAS) and Lotus 123.
- f. ***Monitoring future use.*** In order to estimate future recreation use, load factors generated from the surveys will be applied to periodic vehicle counts of identified dispersed recreation areas.

## Results

A total of 1,735 surveys were distributed to visitors during the study period from October 1986 to May 1987. Of these, 535 surveys were returned for an overall response rate of 30.5

percent. Most of the respondents (95 percent) came to Kerr's dispersed-use areas for the purpose of recreation. These recreators were largely day users (98 percent) that came from the six counties surrounding the lake. Although hunting was believed to be the primary dispersed use activity, it was found that fishermen were actually more prevalent. Visitors spent 4.3 hr on the average recreating at Kerr's dispersed-use areas although 2 hr was the most common length of stay. Approximately 13.8 vehicles were found in each sampling unit (i.e., any possible area on any possible sample day). Each vehicle contained an average of 1.69 persons. Other information such as visitor satisfaction, dispersion from visitor's vehicles, and visitor's arrival and departure times were analyzed.

Of chief interest were the visitation estimates obtained using the following formula:

$$\begin{array}{lcl} \text{Total} & \quad \text{Total number} & \quad \text{Mean number} \\ \text{visitor} & = & \times \\ \text{hours} & \quad \text{of recreational} & \quad \text{of persons} \\ \text{per strata} & \quad \text{vehicles} & \quad \text{per vehicle} \\ & \quad \text{per strata} & \\ \end{array} \quad \begin{array}{l} \text{Mean length} \\ \times \\ \text{of stay per} \\ \text{person} \end{array}$$

Strata totals were added together to obtain the project-wide visitation estimates for the study period of 262,952.7 visitor hours of use.

### Study Implications

Clearly there is a need to better understand the amount and nature of recreation use occurring on dispersed recreation areas. The vehicle access technique described has been shown to be useful for obtaining information from dispersed-use areas with multiple access points and a mobile, fluctuating type of recreation use. Visitation estimates for John H. Kerr Reservoir were obtained for the study period. In addition, valuable insights about the dispersed recreation user were revealed. Many of these insights could be used by project personnel to provide opportunities for rewarding recreation experiences while at the same time protecting natural resources.

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## **ECONOMIC IMPACT ANALYSIS AS A TOOL FOR RECREATION MANAGEMENT**

by  
**R. Scott Jackson\***

### **Introduction**

Increased emphasis has recently been placed on the participation of non-Federal sectors in providing recreation opportunities at Corps of Engineers water resource development projects. This initiative requires consideration of values important to public and private recreation program partners at the state and local level. While over 40 percent of recreation areas on Corps projects are managed by non-Federal groups, the agency continues to seek increased participation by non-Federal partners to accommodate increased demand for recreation resources. Many regions of the United States depend, to varying degrees, on recreational expenditures as an important source of economic activity (Alward 1986). Local leaders have therefore placed an increased importance on public recreation opportunities as an essential ingredient in maintaining economic development through economic activity stimulated by visitor spending. The purpose of this paper is to describe and demonstrate a procedure for determining the economic effects of Corps of Engineers recreation programs.

The Corps of Engineers has traditionally evaluated planned recreation development in terms of direct benefits to the visitor as defined in the National Economic Development Account of the Water Resources Council's Principles and Guidelines (US Water Resources Council 1983). Net benefits included in this type of analysis are defined as the total amount an individual is willing to pay to engage in a recreational activity minus the cost incurred by the visitor to participate in the activity. The unit day, travel cost, and contingent valuation are accepted methods for measuring user benefits. Each method is appropriate for specific applications depending on the level of accuracy needed, availability of data, and planning questions being addressed (Walsh 1986). However, these procedures ignore the benefits to local and regional economies stemming from expenditures made by recreation visitors. These expenditures are important to non-Federal interests when evaluating the potential "return" on investment in recreation development and programs.

### **Economic Impact Analysis**

The economic effects of recreation use associated with Corps projects can be viewed as the income and employment business derived as a direct or indirect result of spending by visitors to Corps projects. Direct effects include income and employment resulting from direct spending by visitors on goods and services required to engage in recreation activities; for instance, the retail purchase of a boat by a visitor. To meet the increased demand for boats resulting from the sale of a boat, boating manufacturers will purchase materials and labor, shipping companies will purchase labor, trucks, gasoline, and other supplies and the

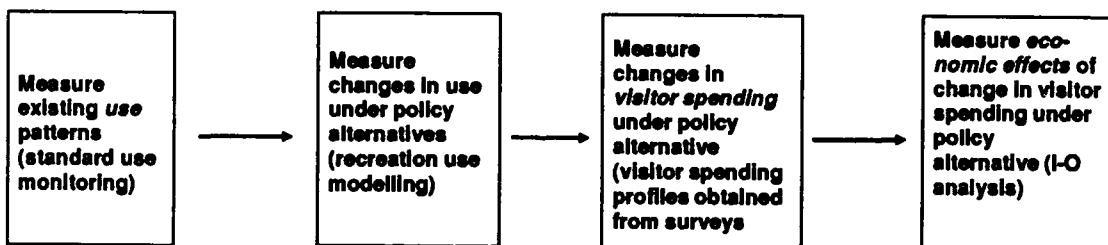
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boat dealer will purchase labor and supplies in support of their retail sales activities. The income and employment resulting from these secondary purchases are the indirect effects of the retail purchase of a boat. The income of employees directly and indirectly supporting the sale of boats increases as a result of each boat that is sold. In turn, this income is used to purchase goods and services. The increased economic activity is the induced effect of the purchase of a boat. Using this example, the sum of direct, indirect, and induced effects fully describes the economic effect of the purchase of a boat. Economic Input-Output (I-O) models are commonly used to predict what the total level of regional economic activity would be resulting from a change in direct spending.

Input-Output (I-O) analysis can assist decision making by providing insights as to how various programs affect regional economies. By tracing spending effects throughout an economy, the extent to which various economic sectors are affected can be determined. When trying to integrate a program or project into an economy it is important to determine who will and who will not benefit from it. Using I-O analysis, a decision maker is able to predict the effects of various changes in policy or agency expenditures on local economies. This gives the decision maker the ability to evaluate the potential economic effects of policy alternatives.

In order to accurately assess the economic effects of recreation policy alternatives it is also necessary to determine how recreation use patterns and resulting visitor spending would change from current conditions in response to the policy alternative. Recreation demand models are commonly used to translate changes in recreation development, resources, and policies into changes in the amount, composition, and distribution of recreation use. Figure 1 illustrates the process and associated tasks for assessing the economic effects of recreation policy alternatives.



*Figure 1. Process for assessing the economic effects of recreation policy alternatives*

### Measuring Recreation Use

The first step in assessing recreation economic effects is to measure the amount of recreation use associated with the lake. Estimates of economic impacts of a project can be no better than the quality of the recreation use estimates for that project. Recreation use is described in terms of user groups (e.g., day users, campers, and hotel guests) that possess homogenous spending patterns. Defining use in terms of user groups possessing similar spending patterns facilitates accurate estimates of total visitor spending in subsequent steps in the process. Economic impact analysis can be used to assess the economic effects of recreation use at a single point in time or it can be used to determine the effects of a change in recreation use resulting from an actual or potential change in policy, management, or resource condition.

## **Measuring Visitor Spending**

A key step in assessing economic impacts is the development of visitor expenditure profiles. An expenditure profile is a series of mean expenditure rates, derived from visitor surveys, for individual goods and services either purchased during a recreation trip or purchased for use on a recreation trip. Visitor spending can be divided into two broad categories. The first is goods and services purchased and consumed during a single trip. These expenses are known as trip expenses. The second category includes durable goods, such as boats and camping, that are purchased and used on many trips. Since durable goods are used over a period of time on multiple recreation trips, the total amount spent on such items must be adjusted downward to reflect usage of durable goods at the project under consideration.

Visitor spending is measured through personal interviews with visitors as they are completing their visit. During the interviews, visitors provide recreation activity information, durable goods spending estimates, and trip characteristics. To obtain trip spending information, visitors are asked to complete a questionnaire and return it by mail as soon as possible after returning to their permanent residence. The response rates for spending surveys conducted in 1989 were 92 percent for the on-site interview and 57 percent for the mail-back questionnaire.

Surveys performed in this work unit are designed to develop nationally representative profiles of visitor spending that will support local Corps I-O applications. This will eliminate the need to perform visitor spending surveys for many routing economic impact analyses.

## **Assessing Economic Effects**

The translation of visitor spending into economic effects in terms of income and employment are accomplished through the use of an Input-Output (I-O) model. The model is an accounting system showing economic transactions between local businesses, households, and governments, as well as transactions between public and private entities located elsewhere. Although an I-O model provides only a static view of economic conditions, it is an effective device for characterizing and analyzing complex local, regional, and national economies. I-O models are constructed for specific geographic regions in order to capture the specific economic sectors and linkage that exist in the region.

IMPLAN, an I-O model developed by the US Forest Service, has been selected from among a number of national models to support applications in this work unit. IMPLAN was selected for several reasons. First it provides more detailed information of some sectors of the economy associated with recreation applications. Second, it is a national model that facilitates standardized application throughout the US and allows national effects to be measured. And third, IMPLAN is supported through training and technical support by staff at the Fort Collins office of the US Forest Service and the University of Minnesota.

## **Conclusions**

The precise application of I-O analysis to recreation management issues at Corps projects requires that recreation use be continuously and accurately monitored at all Corps projects. The creation of nationally representative spending profiles developed in this work unit coupled with accurate use estimates will produce an effective and cost-efficient approach for measuring economic impacts. The development of recreation demand models developed in a related work unit in the Natural Resource Research Program is a key requirement for predicting the potential economic effects of policy and management alternatives not yet implemented.

I-O analysis can be an important tool to evaluate the economic implications of management and policy decisions. This work unit will support I-O applications. As non-Federal groups become more actively involved in the Corps recreation program, the Corps needs to improve the capability to identify and evaluate the regional effects of policy and resource allocation decisions. These regional economic development effects should be viewed, however, as a positive byproduct of a Corps project constructed and managed to support national economic development through the provision of benefits to the visiting public.

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## **REGIONAL RECREATION DEMAND MODEL WORK UNIT**

by  
Jim E. Henderson\*

### **Introduction**

The impetus for this work unit comes from the need to account for and to predict recreation use and benefits resulting from changes in the supply and quality of recreation resources. In 1983, the US Water Resources Council (USWRC) (1983) recommended development of regional models to reduce the time and effort required to conduct an evaluation of benefits. By combining data from a number of different projects, the effect on use of different project attributes, operation schemes, or user characteristics can be explicitly determined and future evaluations could be expedited.

### **Recreation Models for the Corps**

The objective of this work unit is to develop models for the Corps to predict changes in use and benefits. The models will be based on:

- a. Demographic characteristics of the market-area populations
- b. Qualitative characteristics and uniqueness of recreation opportunities.
- c. Costs and characteristics of substitute recreation opportunities (USWRC 1983).

The above factors permit generation of use estimates over time that vary with underlying determinants of recreation demand. There are three types of applications for use of regional recreation models in the Corps: (a) to model use and benefits at existing projects, (b) to determine demand for new projects, and (c) to estimate changes in use and benefits from changes in quality or quantity of recreation resources.

#### **Existing projects under normal conditions**

By using historic data, models can be developed that relate use and benefits to project attributes and visitor characteristics.

#### **New projects**

Determining the effects of a planned project can be accomplished after a model of existing project conditions is developed. Although the Corps is not constructing a lot of new projects, local, State, and other Federal agencies construct and modify their projects and these changes in the recreation supply affect the demand for Corps resources.

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## **Changes in quality or quantity of recreation resources**

Decisions on planning and operation of natural resources are improved by being able to determine the relation of recreation use to the quality of the recreation experience and supply of the recreation resources. The quality of recreation experience is expressed in terms of such things as congestion, water levels, fishing success, and water quality. Changes in quantity are in terms of the overall supply of recreation resources for a region and the effects of available substitutes for the recreation resource.

### **Development of a Corps Regional Model**

The development of Corps regional models will be based on the requirements and constraints of decision making for Corps Planning and Operations activities. The decision-making requirements that support those activities affect the structure and design of a model. A third consideration in model development is availability of data.

Available data that could be used in a model include data from the traffic-stop visitation surveys, the Campground Receipt Study, and the Automated Use Permit System. These data provide valid estimates of use that are related specifically to available Corps resources. In cases that are concerned with a new project or where non-Corps projects are included in a region, some adjustments have to be made because the non-Corps projects may have different data on use, e.g., different units of measure. A common approach when lacking project-specific use data is to use general population surveys to produce participation rates that are used to estimate demand for specific recreation opportunities. With household surveys, it is more difficult to link supply and demand because the preferences are not linked to demand for use for a particular site.

Another data consideration for future projects is planning for non-traditional recreation projects. There are substantial data for traditional reservoir recreation projects, but relatively sparse data on the small boat harbor and other coastal projects that are increasingly numerous.

### **State of the art**

Since the USWRC recommendations to develop and use regional models in 1983, much work has been done by other agencies and by academic and private interests to develop regional models. Much of this work has direct applicability for development of a Corps model. It is the state of the art of regional modelling that will determine the ability to meet the Corps needs.

There is some question on the ability and need to model recreation use and benefits at below the project level. That is, there are often decisions that are made affecting resources at a project, such as deciding which recreation area to close. Regional recreation models are developed to show the change in use at a project, and other projects in a region, resulting from the closing of a recreation area. Determining how the use within a project would be redistributed to other recreation areas within the same project is a question that requires a greater amount of data than the regional model.

## **Modelling Recreation Use**

In envisioning how a Corps model could be configured, one can say that recreation use is determined by a set of project attributes, project factors, or characteristics of the recreation resource, which provide recreation opportunities. The project factors interacting with the project users result in consumption of those recreation opportunities. The consumption of those recreation opportunities by individuals is conditioned by user characteristics.

### **Project factors**

The project attributes correlated with recreation use are different from region to region. In a model for California projects, four project factors were used: number of boat lanes, fishing success, number of parking spaces, and number of campsites. These project factors were used in conjunction with travel distances to determine how recreation use would be allocated among 83 reservoirs, lakes, and other water sites. What is important to note here is that these project data are readily available or can be easily estimated or developed. For instance, fishing success can be obtained from creel surveys or fish stocking records.

### **User characteristics**

The characteristics of users in the region determine participation in recreation activities. The most consistent relationship to recreation use has been with age and gender. In many models, income is used as a predictor of recreation use. Income does not form preferences for types of recreation but limits or conditions the expression of preferences or tastes. In some cases, amount of leisure time and experience with recreation activities have been used to explain levels of use, but less consistently than the other factors (O'Leary, Dottavio, and McGuire 1988).

### **Benefits**

The project factors and user characteristics are related primarily to recreation use estimates. The estimates of benefits are based on techniques that evaluate willingness-to-pay (WTP) for recreation. WTP methods include Unit Day Value Method, Travel Cost Method, and Contingent Valuation Method. In regard to use of the WTP methods in regional models, each method has increasingly stringent data requirements and limits on the applicability of the method.

## **Literature Review and Plan of Study Meeting**

Several years ago, a literature review was performed for a regional recreation demand model. The literature review has been updated and a summary and annotated bibliography prepared.

Next month a meeting will be held to provide input for a plan of study (POS) for development of Corps recreation models. The meeting will bring together experts in recreation modelling and Corps personnel. Planning and Operations personnel can explain

their needs and constraints regarding use and benefit models. The consultants and academic experts will present the state-of-the-art information and explain what is possible, given the availability of the right data and other needs. Data availability for Corps applications will be discussed.

From the input derived from the meeting, a POS will be developed to guide the remainder of the work unit efforts. The remainder of the work may change somewhat after preparation of the POS. At this time, it is anticipated that in fiscal year 1991 an initial regional demand model will be developed and documented. The initial demand model will be utilized in test applications for various Planning and Operations studies. Based on evaluation of the initial model, the model will be adapted or additional models will be developed to meet requirement of all Planning and Operations applications.

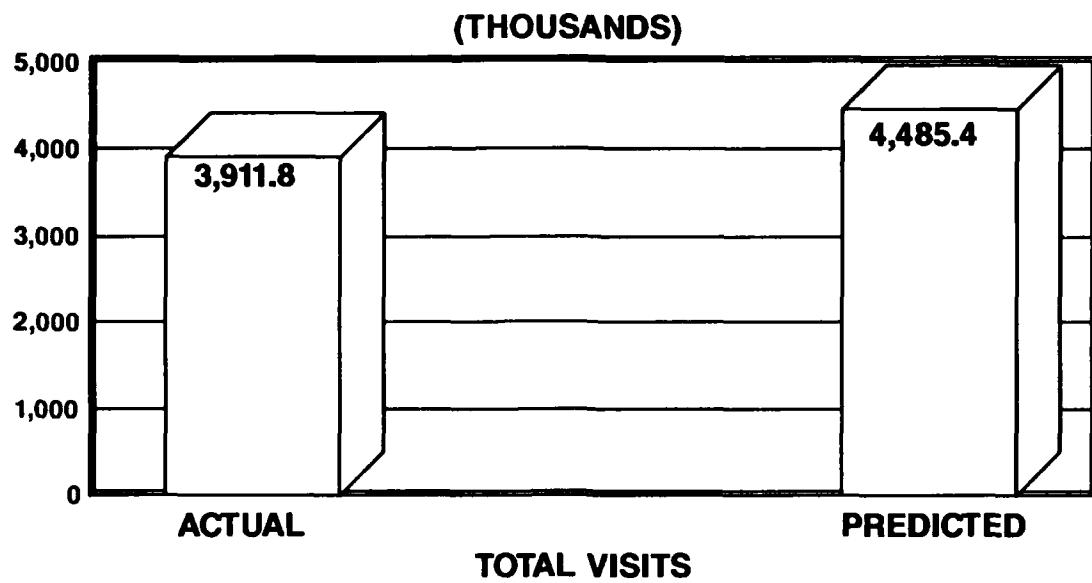
### California Water Resources Model

As mentioned above, the California Water Resources Model is a regional recreation model for 83 projects (Wade et al. 1989a). The model was applied to 12 Sacramento District reservoir projects and the predicted use compared to recorded use for the 1985 recreation season (Wade et al. 1989b). These results point up some of the problems and considerations in doing recreation modelling.

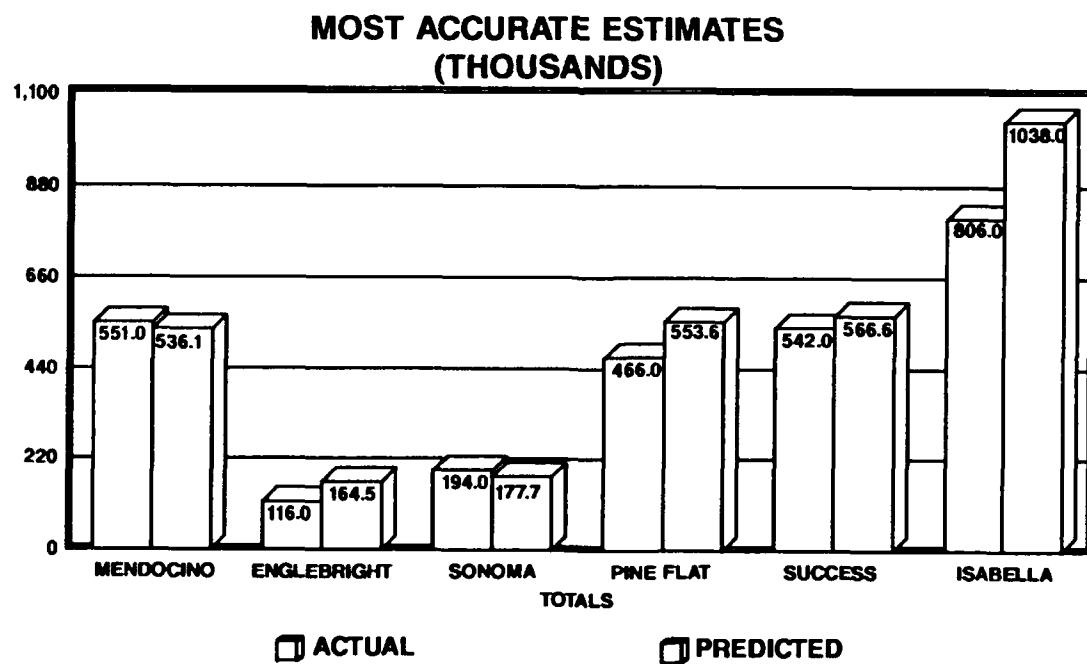
The California Water Resources Model is a gravity travel-cost model that allocates recreation use for the activities of boating, fishing, swimming, and picnicking. Direct project level use surveys were not available for all of the 83 projects, so that it was necessary to use a household survey of recreation preferences. That is, participation rates from the household surveys were used rather than visitation surveys. Distribution of users to different recreation sites was based on travel distances and costs, availability of substitute sites for the activities, and attractiveness of the projects. Attractiveness was based on the project factors mentioned earlier: number of boat ramps and slips, fishing success (natural fish production), number of parking spaces, and number of campsites.

Visitors from an origin seeking a particular activity are allocated by the model to the site that provides the most desirable recreation services at the lowest access costs. The developed model was applied to 12 Sacramento District reservoirs and visitation was compared to 1985 actual recorded visitation. Comparing actual and predicted visitation for the 12 reservoirs, overall visitation was overpredicted by approximately 12 percent (Figure 1). For some projects, the predictions were very accurate (Figure 2), whereas for other projects the predictions deviated to varying degrees from actual visitation (Figure 3). Benefits allocated to each reservoir are shown in Figure 4. The benefits were based on the Travel Cost Method, using the allocation of visitation determined by the model.

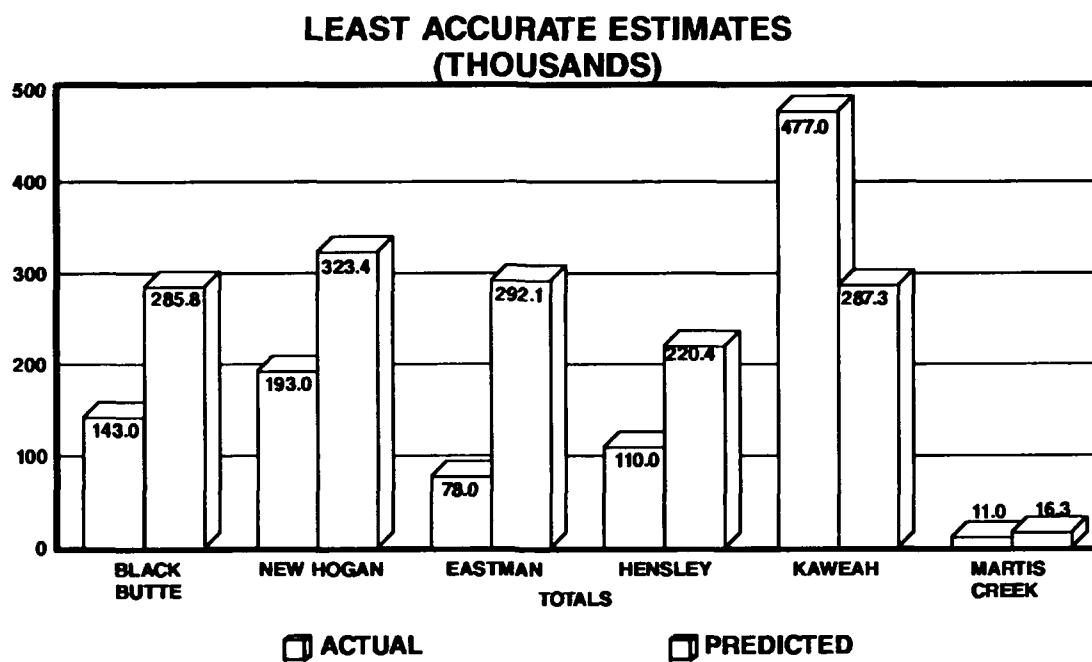
In examining the model and the data, it was suggested that the deviations resulted from factors affecting access to projects by urban residents and changes in resource conditions. These factors include remoteness of some sites and travel time required to reach them. It was recommended that an accessibility parameter be added to the model correcting for differences in accessibility to main highways. A resource condition affecting recreation use was the drought during 1985, resulting in summer pool levels less than 60 percent of capacity in some cases.



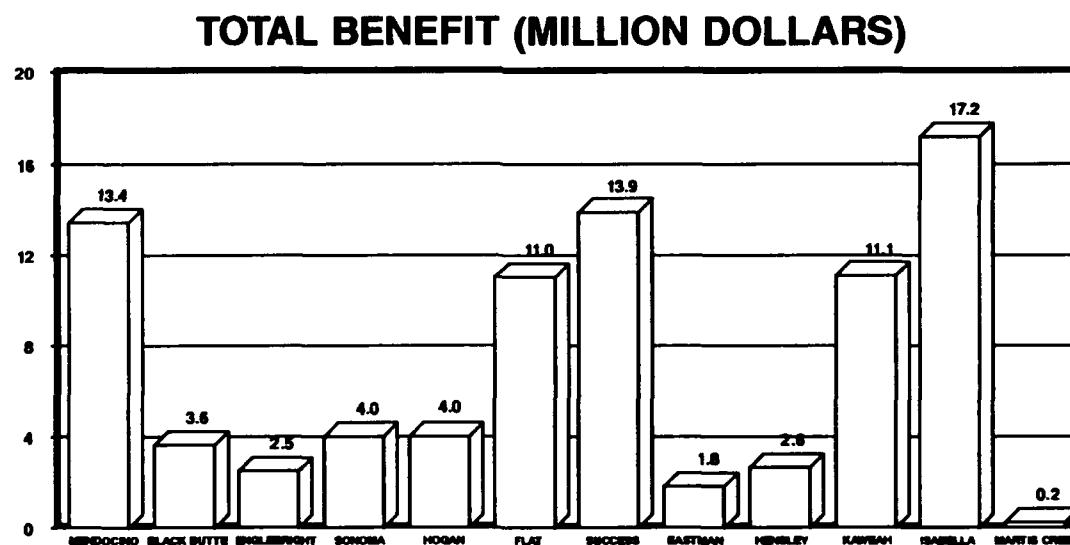
*Figure 1. Comparison of predicted and actual visitation*



*Figure 2. Comparison of most-accurate estimates*



*Figure 3. Comparison of least-accurate estimates*



*Figure 4. Benefits predicted from each project*

There are a number of important points to be noted in the application of the California Water Resources model to the Sacramento District projects. The Model was developed for a large number of projects, managed by a variety of private, local, State, and other Federal entities. Given the diversity of projects, it is highly unlikely that a data set could be produced that encompassed historic use data for all of the projects. The participation rates generated from the general population survey enabled aggregate recreation use patterns to be directly measured and applied to project factors important to estimating visitor use. The project factors used in the model to determine attractiveness are all readily available from project data. Application of the model to the Sacramento District projects demonstrated the need to adjust the model for existing resource and access-related conditions, e.g., proximity to major highways.

### **Summary**

Regional recreation models can be developed to improve decision making for a number of Planning and Operations activities. The development of regional recreation models for the Corps will be determined by needs, constraints, and available data, conditioned by the capabilities of the state of the art of recreation modelling. A POS will be developed incorporating the Corps considerations for recreation models along with the state-of-the-art factors.

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# **RECENT DEVELOPMENTS IN TRENDS FOR CAMPGROUND RECEIPT STUDY DATA ANALYSIS**

by  
**John P. Titre\* and Tere DeMoss\***

## **Introduction**

The Campground Receipt Study (CRS) continues to be one of the Corps' most viable sources of information to cope with changes in where people camp, who they are, and what they bring with them. The main strength of the CRS remains its ability to report trends from a representative sample of projects across the nation over a multi-year period. The longitudinal nature of this study effort is uncommon in data sets found in other wildland resource management agencies. The CRS provides an important benchmark to cope with changes in uncertain events such as the 1988 drought, fees charged for different campground amenities, and shifts in the type of camping equipment used along with characteristics of the Corps customer. A second strength of the CRS is that it provides the opportunity to aggregate projects across a single variable such as prior visits. Information like this can be useful for District personnel attempting to compare projects that continue to attract newcomers versus projects that retain high percentages of return visitors. This has implications for development actions such as campground renovation as well as other efforts aimed at coping with changes in characteristics of the visiting public.

The CRS is currently undergoing some of its most significant developments since it was first established in 1978. A reduction in time and effort resulting from statistical analysis on the microcomputer using the Statistical Analysis System (SAS) has allowed researchers to develop canned programs that calculate important management decision inputs such as occupancy rate analysis. This was introduced last year and is becoming a regular part of the CRS output. It will allow managers to examine how campgrounds are performing in regard to capacity on a monthly, seasonal, and yearly basis. Graphic display of these results can be packaged as a report to answer specific management questions that may help explain reasons for different occupancy rates. In addition, items like campground occupancy can be examined across various levels of aggregation depending on who needs to know what about a project.

The use of SAS for data analysis combined with a dBase input procedure has streamlined the time output can be produced to answer specific questions. SAS and dBase offer the ideal microcomputer environment for data management. This partially responds to a persistent criticism of the CRS related to the length of time it takes to find out about users to a project, which is normally 1-2 years. Answers on camping trends often reach the projects or other levels long after their usefulness. The trends reported may be interesting, but they become academic in terms of their relation to on-the-ground decisions. Unanticipated questions would still require more time to customize the statistical output; however, this is still considerably less than the time it took in the past to produce a final

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product. In some cases, District personnel may elect to receive training in SAS available from the US Army Engineer Waterways Experiment Station (WES) to conduct their own analysis. Below are the steps currently in use to take the information from the Corps customer to the Project Manager for the purposes of better recreation and natural resource management.

**Data management of the CRS:**

- a. Information is collected on ENG Form 4457-1.
- b. Data are entered with a dBase data entry program.
- c. An SAS data set is created.
- d. Data are edited with an SAS data edit procedure.
- e. Predeveloped programs are run on the SAS data set.
- f. Packaged outputs are produced:
  - (1) Tabular, i.e., frequencies, means, sums, etc.
  - (2) Graphic, i.e., calendars, revenue pie charts, occupancy rate bar charts, etc.

### **Significant National Trends**

There are a number of significant national trends related to Corps management that warrant discussion before addressing specifics of applications to the CRS. For a number of years the US Department of Agriculture Forest Service has conducted national recreation assessment studies as a part of its regular strategic planning initiatives. The Southeastern Forest Experiment Station recreation staff have been charged with compiling statistics on the supply and demand of wildland recreation opportunities nationwide to provide information to allow managers of Federal land management agencies to better plan and manage public resources. The staff has revealed a number of trends that are particularly interesting from the standpoint of the Corps in terms of its slice of the supply of recreation opportunities. As a nation, we are growing older and taking part in closer to home activities (Cordell and Siehl 1989). This is significant since a majority of Corps lakes are within 50 miles (80 km) of a major metropolitan center. Users are making shorter trips and staying longer and in some cases replacing the 2-week family vacation. A majority of the visits (9 out of 10) are for day use. Generally, Federal agencies are experiencing a slower rate of participation in recreation activities although dramatic differences occur depending on the activity. Water continues to attract activities since it was first mentioned as being important to recreation in 1962 with the publication of findings from the Outdoor Recreation Resources Review Commission. Warm-water fishing and motorboating are ranked just below attending outdoor sports events in terms of millions of trips taken by Americans (Cordell and Siehl 1989). A trend not reported by Cordell and Siehl (1989) yet apparent in discussions with marina operators and evident in participation in boat shows (Ward 1989) is that baby boomers are bearing children and purchasing boats at rates higher than in previous years. Some managers contend that water activities are to the 90's what wilderness backpacking was to the 70's in relation to this baby boom generation.

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# **GUIDELINES FOR IMPROVING OPERATIONAL MANAGEMENT PLANS**

by

Linda D. Peyman-Dove,\* Michael R. Waring,\* and John P. Titre\*

## **Introduction**

The purpose of this paper is to describe the status of an ongoing study on improving operational management plans (OMPs). This paper briefly addresses the first part of the study: the status, content, and implementation of OMPs; and describes the development of and findings from the second part of the study: an information exchange workshop on improving the OMP process.

### **Operational Management Plans: Status, Content, and Implementation**

The objective of this study was to better understand the current status, content, and implementation of OMPs by US Army Engineer District and project personnel. An understanding of the existing situation can facilitate measures to enhance both adoption of OMPs and increase their effectiveness toward improving project operation and District coordination.

A questionnaire was developed to obtain this information and was reported in last year's Program Review Proceedings. Also, findings from this questionnaire are described in Miscellaneous Paper R-89-2, "Operational Management Plans: Status, Content, and Implementation." This questionnaire formed the basis for the workshop discussed later in this paper.

In summary, the questionnaire was mailed in December 1988 and showed that only 5 percent of the OMPs were complete, while 20 percent were either under review or revision. Respondents predicted that by 1990, approximately 85 percent of the OMPs would be complete. Since these OMPs will need to be updated, additional guidance may be beneficial, especially if projects are going to continually improve the quality of their OMP.

The questionnaire addressed specific needs of the projects for guidance in preparing the OMP. Respondents were asked about the type of guidance needed from three levels within the Corps and three methods of instruction. Nearly 75 percent of the respondents felt that a workshop would fulfill guidance needs. Based on these findings and information from the 1989 Natural Resources Research Program Review, an information exchange workshop was developed. The workshop was entitled, "Operational Management Plans: Improving the Process," and was held in Arlington, TX, 5-6 December 1989.

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## **Workshop on Operational Management Plans: Improving the Process**

The purpose of the workshop was to bring together a representative group of Corps personnel having responsibilities for preparing, reviewing, and implementing operational management plans. Specific objectives of the workshop were to:

- a. Exchange information on approaches and experiences for preparing OMPs.
- b. Discuss progress made and identify areas for improvement.
- c. Recommend future direction and identify needs.

The workshop was organized into two morning speaker sessions followed by two afternoon discussion sessions. The speaker sessions were arranged so that they started with project managers, since projects are generally responsible for preparing an OMP and carrying out the annual work plan. Subsequent speaker sessions dealt with aspects of putting the OMP into practice. They included: (a) District coordination, (b) master planning, (c) automation, and (d) final considerations. In addition to the five morning sessions, which included 17 speakers, an afternoon discussion format was selected to solicit input from all participants. The afternoon sessions included the following topics: (a) purpose of the OMP, (b) conducting inventories, (c) master planning, ad (d) recommendations. The afternoon sessions were related to the material presented each morning and were intended to generate greater discussion and to provide depth and clarification.

A modified nominal group technique (NGT) was used in the discussion sessions. The purpose of the NGT was to solicit input from heterogeneous groups of people and foster exchange. The goals of the NGT are to: (a) promote diversity of viewpoint, (b) promote balance participation among groups, and (c) develop perception of critical issues. This technique is described in detail in "Proceedings Workshop on Operational Management Plans: Improving the Process."

As the final step in the NGT, the entire group voted with individual ballots for the top five responses to each question. These items were discussed in a final plenary session and are summarized below. If any of the five responses were repetitive, only one of the repetitive responses is listed.

### **Purpose of the OMP**

The discussion group sessions began with a question related to the purpose of OMPs. It seemed important to understand workshop participants' perceptions of an OMP before presenting other questions related to OMP preparation and implementation. The question was stated as "What purpose should the OMP serve? e.g., what are the information needs at Division, District, project, and HQ-USACE levels?"

The final responses included:

- a. Implement resource objectives.
- b. Enhance coordination and communication.

- c. Identify and justify budgetary priorities.
- d. Delineate park and resource objectives.

## Inventories

There were a number of participants who voiced interest in discussing the topic of resource inventories. The question for the session was phrased as, "Give us your thoughts on how the resource inventory fits into the OMP process (e.g., When should it come into the process? What level of detail? Who does it?)."

The final responses to this question were:

- a. Relate level of detail to project objectives.
- b. Prepare inventories first, but they are a continual process.
- c. Do not duplicate previous efforts.

## Master planning

Because of the interest Corps personnel have in how the Master Plan and OMP should work together, the following question was posed to the group:

"What is the relationship between the Master Plan and the OMP? (e.g., Are they part of the same process? Where does the OMP pick up from the Master Plan?)."

Final responses to this question are listed below.

- a. Master Plan - charts long-term project goals.  
OMP - provides means to achieve the goals in terms of specific objectives.
- b. Master Plan - reflects a macro perspective (what, where, why, who).  
OMP - reflects a micro perspective (how, when, who).
- c. Master Plan - prepare first and compile base information and inventories.  
OMP - draws upon information in the master plan to plan and execute project objectives.
- d. Both are outputs of a continuous, dynamic process; neither is subordinate.

## Final considerations

The last session of the workshop was used to wrap up key issues and answer the general question "Where do we go from here?".

The following is a list of the final responses.

- a. Projects - prepare the OMP.  
Districts - prepare OMP guidelines.
- b. Conduct workshops.

- c. Maintain flexibility to insure OMPs serve their intended purpose.
- d. Define the OMP process and procedure.

## Conclusions

The workshop established a dialogue for those attending to share both positive and negative first-hand experiences with the OMP process. The workshop moderator and coordinators intended for this tone to permeate morning and afternoon sessions. In a dialogue, positions are not rigidly held and people are willing to listen to others and interact to promote constructive change. Such an atmosphere aided in making this a true workshop rather than a training course. Based on past experiences, participants shared information about preparing OMPs in addition to what was offered during the regular sessions.

Considerable interest emerged with the discussion of a future workshop. It was felt that a workshop would allow participants to share their experience and knowledge, while gaining from others. It was also evident that the OMP is a process rather than a product. The time and effort afforded the decisions made in the Master Plan should be evident as a thread in the OMP. Collectively, participants learned that there are no definitive answers as to what constitutes a good OMP. Workshop participants did learn that although there may be common elements of an OMP, approaches are often dependent on a myriad of situational factors found on the project. For that reason, it would be difficult to state that one OMP is better than another without understanding factors related to the physical resource, the amount and type of recreation use, and the management influence on the project. This is not to diminish the importance of identifying criteria for evaluation of OMPs. General criteria, such as those developed for writing management objectives, provide an example of performance standards for OMP evaluation. Finally, several Division offices have taken the lead in developing checklists used by reviewers and have made them available to those preparing OMPs. This would allow writers of OMPs to better understand what is expected of them. Furthermore, checklists are flexible to accommodate the needs of each Division and they can be used for updated OMPs as well as first draft reviews.

The workshop and its proceedings are only a start in assembling the information necessary for improving the way OMPs are compiled and implemented. These efforts are a success to the extent that information exchange continues among rangers, managers, and specialists in project, District, and Division offices who build on this information with internal meetings or written memoranda to refine what was presented and discussed.

Based on the results from the workshop (especially the overwhelming agreement on training/information exchange in a similar workshop format), and on subsequent discussions with Program Management and others, we feel that this work unit should be reexamined. It appears that this research effort is concluded; future work should concentrate on formulating and conducting an additional workshop(s) to aid in exchanging information and presenting new ideas. The purpose of this workshop would not be to set policy or dictate that OMPs would be done in a specific way by everyone. Rather, it would serve as an excellent forum for exchanging ideas that work and don't work; in effect, this would allow the workshop attendees to "train" each other, rather than the US Army Engineer Waterways Experiment Station or some outside entity "training" the field.

# **DEVELOPING A MANAGER-ORIENTED WATER-BASED RECREATION INVENTORY AND EVALUATION METHODOLOGY**

by  
John P. Titre\*

## **Introduction**

Over the past several years, the Resource Analysis Group (RAG) of the Environmental Laboratory, US Army Engineer Waterways Experiment Station, has replied to a number of technical requests under the Natural Resources Technical Assistance Program to address problems of overuse and crowding. Generally, the issue is too many boats during the peak-use periods of summer, weekends, and holidays. In responding to these requests for assistance, the RAG has assembled a knowledge base from experiences on how to address the problem and how to devise strategies for resolving these issues. The collective experiences of managers and rangers who deal directly with the public are a valuable component of that data base. The challenge is to develop a manager-oriented approach that systematically gathers data at low cost and can be implemented by field personnel. Lack of a systematic approach hampers decision authority and prevents resource managers from taking a proactive stance for charting the future use of lakes and reservoirs. This paper outlines some general lessons obtained from these experiences and suggests a "prototype" process that has achieved early success in understanding the situation and prescribing actions to reduce the effects of overuse.

### **Emphasis broadened**

One of the first lessons was that emphasis on boating alone severely limits the *scope of the problem* and stymies the search for creative solutions. Visitors obtain access to a lake from the land via roads and some point of origin. They choose a destination from an array of similar resource settings, often within driving distance of a definable region. The activity of boating is a by-product of inner drives to be near water. Being near water may involve a host of other activities along with specialized technologies that enable people to engage in outdoor experiences. The long lines of visitors with boats waiting to launch, conflicts between jet skis and board sailors, and campsites encumbered with a collection of watercraft paraphernalia are evidence that the problem is bigger than boating. Therefore, the more encompassing term *water-based recreation* is used in this text.

### **Problem Of Overuse**

#### **Increased numbers**

Projects have reported an increase in the *amount of use* with little exception. As a mathematical equation, this would be a given or a constant that management must accommodate somehow, somewhere. More use puts a greater strain on facilities and staff. The

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only relief is that water-based recreation use tends to be concentrated in time and place under somewhat predictable conditions. Any ranger working during the Fourth of July weekend does not need a researcher to reveal this fact. Solutions such as innovative approaches to alternative fee structures and incentives to redistribute use during weekdays and the off-season deserve greater attention and investigation to document cause and effect.

### Diversity of activities

In addition to the amount of use, the *type of use* plays into the equation by adding complexity. Single and now tandem jet skis are a good example of how technology is defining the manner in which people use water bodies. Even within water skiing, there exists a greater diversity of craft with each boat/skier requiring a moving "bubble of territory" that exerts influence on other activities. The recording of many "near misses" in conducting the technical requests is evidence of this. What the future holds for continued diversity is anybody's guess. For that reason, it is imperative to have a plan based on the ability to accommodate new uses. The managerial attitude of a caretaker will no longer suffice to provide for increased pressures combined with greater diversity in the types of user groups.

### User demand for higher quality

People seem to be demanding more in the workplace and in leisure settings. They expect quality facilities and a return on the personal investment of engaging in outdoor activities. The open-ended responses to several questionnaires over the years indicate greater awareness of management's ability to give them what they are looking for. Increases in fees for camping may have contributed to visitors demanding something for the dollars spent. At the same time, visitors to areas with no fees or low cost also remark about the length of the grass, cleanliness of the restrooms, and "people problems" where management is required. Demands for higher quality increase pressure on managers to have answers about how the lake is being managed to meet customer needs.

### Incompatible uses

Conflicts among water-based recreation uses are inevitable. Studies conducted at Corps lakes have shown that user groups with less ability to maneuver on a water body tend to be dominated by groups with greater ability. Complaints by johnboat fishermen in finger channels about powerboats cruising by while they are bass fishing is an example of this incompatibility. Watching board sailors attempt to outmaneuver jet-ski users is a classic example of recreation conflict. Board sailors have a low tolerance for jet-ski users (Titre 1984). This supports wilderness research findings that document differences between motorized and non-motorized canoeists. The problem of incompatible use will tend to get worse with increased use and a diversity of user groups. Zoning sections of the water for different types of use is a management tool likely to be effective in reducing the effects on incompatible user groups.

The problem of increased use, diversity of activities, and incompatible uses raises the question of who the lake should be managed for. Which groups should the manager provide

for, and which groups should the manager attempt to demarket or discourage? Any active manipulation of management tools such as zoning should be precluded by carefully written objectives. This will be addressed under the section "Manager-Oriented Process."

### **Accidents**

Crowding can cause accidents. Accidents are an obvious red flag to identify a problem for management. Managers often cite accidents to justify actions that reduce human injury. Research can recommend management actions to provide for conditions under which safe levels of use will occur. Education is one management tool which can reduce accidents while use is actually increasing. Recreation use and accidents are subject to a number of influences that may be outside the control of management. Therefore, safety should not be the sole justification for initiating crowding studies or prescribing actions.

### **Resource impacts**

Regulations that protect the resource are often related to overuse. Parking on the grass is strictly enforced in some areas where dry conditions and thin soils show the effects of traffic quickly. Soil compaction in campgrounds has forced some managers to rehabilitate conditions or close areas to allow natural recuperation. Ignoring resource impacts in a study of overuse would be a mistake. Regular inventory procedures should carefully document where these impacts are occurring and strategies to alleviate the effects of overuse should incorporate this information.

### **Research needs**

Based on the number of technical requests and phone calls each year concerning what to do about overuse, it is unlikely that the problem will disappear. Guidance is needed in the form of a methodology that managers can 1) understand, 2) use with their staff, and 3) communicate to various publics. Any approach must involve systematic data collection, analysis, and reporting that is defensible before specific actions are taken. What is called for then is a *manager-oriented process* that clearly outlines steps that describe "where we are" and "where we want to be" in terms of sound management. Although research plays a significant role in assisting management in sorting out the complexity, the job rests in the hands of managers and rangers who must answer questions on a daily basis. Their familiarity with the steps must become part of doing business in today's job of lake management.

### **Manager-Oriented Process**

This process has been adopted primarily from the efforts of two university researchers who have devoted a number of studies to the topic of crowding. Dr. Alan Graefe, from Pennsylvania State University, has developed a system for the National Park Service that focuses on indicators of changing conditions and satisfaction with current levels of use. Dr. Kenneth Chilman, from Southern Illinois University, has also worked with the National Park Service, among other agencies. His Quality Upgrading and Learning System emphasizes the importance of inventory and mapping techniques to help managers prioritize

where actions need to be taken. Both systems have certain advantages for application to Corps lakes.

### **Step one**

The process begins with a meeting where managers, rangers, and researchers agree that the overall goal is to provide quality experiences. We all want lakes where people can safely enjoy outdoor experiences and benefit from the Nation's natural resources. Quality implies that people have choices in the kinds of activities that they engage in. Providing for that range of choice is a critical ingredient in providing for quality. At the same time, we must recognize that all lakes cannot be all things to all people. Quality must be examined in a regional context to identify opportunities better provided by other lakes. Uniqueness factors into the examination of regional opportunities and in many ways reveals solutions to redirect use to more appropriate locations in matching people's needs with the resource. This is called an environmental link. Research in marketing and market segmentation may assist in directing visitors to the places they seek. Therefore, consensus on quality in a regional context is the first step in careful planning.

### **Step two**

Inventory and evaluation of current conditions is basic to professional training in forestry and wildlife. Extensive field work is necessary to map out where use is concentrated by the type of activity. Acetate overlays are a practical way to transcribe this data in the field. Geographical information systems, where available, could enhance the analytical power of the collected data but are not critical to this step. Resource impacts should be carefully noted in relation to overuse. During the inventory it often becomes obvious where the problems are. This in turn directs data collection efforts aimed at finding out what users think about current conditions. Although not limited to questionnaires, e.g., observation can be used, the procedure is for a researcher to devise a sampling plan and then direct the interviewing of visitors. Standard questions have been developed and sampling rules have helped to simplify the task of contacting people. Contrary to the belief of some resource managers, visitors tend to enjoy talking about their experiences. This is their chance to vote on the future of a lake that they use.

Questions are aimed at finding out where visitors are coming from, whether this is their first visit, what type of conditions they desire, observed changes since they first visited, other lakes visited for similar experiences, and general suggestions for management. Specific indicators of change are also included from the inventory and evaluation step in the questionnaire. Analysis of the data is performed by "canned computer programs" that produce percentages, means, and bar and pie charts. Interpretation of the results can be done by a researcher or field personnel with some experience in this area. Emphasis is on keeping the analysis straightforward and easy to understand. At times, state-of-the-art technology development may be incorporated into questionnaires. Generally, this is a small portion of the questionnaire and is used to advance knowledge for application to other situations.

### **Step three**

With a compiled report on current conditions, managers can again sit down with researchers and/or other staff members from other institutional levels to examine the findings. Objectives that have been prepared are critically examined and may be rewritten to reflect this new information. Limited resources require that managers focus attention on problem areas as part of a priority determination. Level of satisfaction and crowding can be mapped to reveal where conditions are severe.

Specific management actions such as zoning can be better evaluated with user data and objectives on the type of experiences that the lake can best provide. Use restrictions or heavy-handed solutions should be considered only after minimal light-handed actions such as informational brochures and education programs have been exhausted. District offices may require less detail to make go-no go decisions on whether to expand a marina, while projects may need more detail about the desired conditions to be provided at one of several beaches. The point is that management is engaging in information-based decision making. The steps are easy to understand and logical to afford explanation before District Engineers and various publics.

### **Step four**

Less experience has been assembled in this area than in the previous three steps. The intention here is to monitor indicators of change as collected through the inventory and visitor questionnaire procedures. Once the prioritized areas are under better control, attention can be focused on areas where problems are emerging. Indicators can tell managers in a cost-efficient manner how actions are performing and what adjustments are needed.

### **Summary**

The problem of increased use of water-based recreation activities deserves the attention of research as evidenced by numerous requests for technical assistance. The problem is broader than boating and encompasses lake access and regional considerations. Changes in society have placed greater demands on the job of managing lakes. There is a need for a systematic, defensible, manager-oriented system to collect data and assist the decision-making process. Management tools should be an outgrowth of carefully worded objectives about the type of experiences a lake can provide. Any system must focus on coping with change and adjust to the dynamic nature of lake management. Although experiences have been assembled on parts of the manager-oriented process, additional effort is needed to test particular strategies under various conditions. This will make the process more applicable to a variety of Corps projects. Monitoring has received the least attention, yet it holds the greatest promise of ensuring quality experiences for the users of Corps lakes.

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# **SURVEY OF WATERFOWL MANAGEMENT PRACTICES AT CORPS O&M PROJECTS**

by  
**Chester O. Martin\***

## **Introduction**

Many Corps of Engineers operational projects provide large amounts of wetland and shallow water habitats used by waterfowl, and Districts often feature waterfowl developments as part of their natural resources management programs. However, waterfowl management practices and philosophies are highly variable among Corps Districts, and there is often little consistency or interchange of information from project to project. Also, although several projects have maintained detailed records of their waterfowl management efforts (in some cases for more than 10 years), this information is not readily available to other Corps natural resources personnel. An assessment of historical records for managing key waterfowl species is needed to transfer technology that would benefit Corps programs nationwide.

## **Objectives**

A study of waterfowl management practices at operational projects is proposed as part of the US Army Corps of Engineers Natural Resources Research Program (NRRP). The objectives of this work unit are to (a) assimilate information on past and present Corps management efforts for key waterfowl species, (b) analyze and interpret the data collected, and (c) transfer the results for the benefit of management programs at all Corps projects and Districts.

## **Background**

The majority of Corps projects provide a substantial amount of habitat of existing or potential value to breeding, wintering, and/or migrating waterfowl. Typical habitats and management practices employed to benefit waterfowl populations on Corps lands were discussed in a report by C. O. Martin (1989). Although numerous species of ducks and geese use wetland and aquatic areas on Corps reservoirs, intensive management efforts are usually focused on the Canada goose (*Branta canadensis*), wood duck (*Aix sponsa*), and mallard (*Anas platyrhynchos*).

Through discussions with project personnel and information published in the Corps newsletter *Wildlife Resource Notes*, it is apparent that many of our projects have collected years of data on management practices involving Canada geese, wood ducks, and mallards. For example, the Mobile District has conducted detailed studies regarding the effects of high temperatures on the production of wood ducks using artificial nest boxes (Hartley and Hill 1988; Hartley and Hill, in press), and the Pittsburgh District has collected 10 years of

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data on nest boxes at 13 projects (Piehler and Fowles 1989). Nest box use information for the Pittsburgh District survey was summarized in *Wildlife Resource Notes*, but much of the data collected has yet to be analyzed. There is hardly a Corps District without a wood duck or mallard management program, and in many cases information has been developed that would benefit waterfowl management efforts at other Districts.

Many of our Districts also have active goose management programs. Corps lakes, especially those in the North Pacific and Missouri River Division, have implemented programs to restore regional populations of Canada geese, and the species is featured for management at numerous projects (Habermehl 1984; Lenning 1984; Grettenberger 1986; R. J. Martin 1988, 1989; Peloquin 1988). Extensive data have been maintained on nesting geese in several Districts. For example, 10 years of data on different types of nesting structures and success rates have been collected at Pipestem Lake in North Dakota (R. J. Martin 1988, 1989). The Portland District has conducted an annual goose nesting survey since 1981. They have also developed a dBase III program for analyzing the data (Karas 1989), and it is expected that many other Districts could benefit from this package.

The Wildlife Resources Team at the US Army Engineer Waterways Experiment Station (WES) has been involved in responding to Natural Resources Technical Support (NRTS) Program requests concerning wildlife and habitat management problems for the past 2 years. Approximately 80 percent of these have dealt with waterfowl management, and most of these have been concerned with the target species previously noted. Because of the large number of NRTS requests and other correspondence among WES and project personnel regarding waterfowl management, a need was indicated for an NRRP work unit that dealt specifically with waterfowl management practices at Corps projects.

### **Study Plan**

The proposed study will consist of a detailed survey and evaluation of current and historic management efforts for Canada geese, wood ducks, and mallards on Corps project lands (to include State management areas). Information will be obtained through questionnaires, workshops, site visits, and examination of project records. In association with the target species selected, the following commonly employed management practices will be examined in detail: (a) nesting structures; (b) sub-impoundments; (c) development of brood habitat; and (d) supplemental plantings. These practices were chosen for analysis because they represent techniques where there is likely to be substantial project information.

The study will include an examination of cost effectiveness of various techniques, and problem areas will be identified. Results will be presented in a technical report for Corps-wide distribution. Major study elements are as follows:

- a. Conduct survey of Corps waterfowl management actions.
- b. Conduct site visits and workshops.
- c. Examine and interpret existing data on selected management practices.
- d. Assess cost-effectiveness and application of various techniques.
- e. Identify potential methods for resolving management problems.

f. Complete data analysis and prepare final report.

### Discussion

Civil Works projects throughout the United States provide a substantial amount of habitat suitable for waterfowl management. Most reservoir projects include waterfowl as part of their natural resources management program, but practices and objectives are highly variable and there is often a limited exchange of technical information among Districts and projects. Many Corps projects have collected years of data on management practices for selected waterfowl species, especially Canada geese, wood ducks, and mallards. However, this information is usually stored away in project files, and there is currently no mechanism within the Corps to transfer this technology to other Districts.

A study is proposed herein to conduct a survey of waterfowl management practices on Corps lands, analyze and interpret the available data, and transfer information that would benefit natural resources management and stewardship programs nationwide. Emphasis will be placed on management strategies employed to improve habitat quality for the Canada goose, wood duck, and mallard. The cost-effectiveness of various techniques will be determined, problem areas will be addressed, and results will be presented in WES technical reports and other suitable media. The study should facilitate Corps efforts to support the long-term goals of the North American Waterfowl Management Plan.

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# MULTIPLE SPECIES MANAGEMENT ON CORPS PROJECT LANDS

by  
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## Introduction

Wildlife management on Corps projects is usually directed toward larger game species such as white-tailed deer (*Odocoileus virginianus*) and wild turkey (*Meleagris gallopavo*), whereas small game and nongame species often receive nominal attention. Development of a management program that incorporates multiple species benefits would enable project personnel to provide additional recreational opportunities on project lands. This approach would also allow greater management flexibility, increase habitat diversity, and improve the overall environmental quality of the area.

## Objectives

A study of multiple species management on project lands is proposed as part of the US Army Corps of Engineers Natural Resources Research Program. The objective of the study is to develop and evaluate wildlife management strategies that offer benefits to several species or groups of species simultaneously, while ensuring that the benefits to target species are maintained. Implementation of the most appropriate practices should increase the diversity and abundance of wildlife populations at a project.

## Study Elements

Management strategies that provide multiple species benefits will be developed and implemented on selected Corps projects. Practices to be examined as part of the study include (a) no-till agriculture, (b) controlled burning, (c) modified forestry practices, and (d) improved plantings. A common consideration in the development of multiple species management techniques will be the spatial arrangement of cover types on project areas.

No-till agriculture has considerable potential to increase populations of ground-nesting birds and mammals (Rodgers and Wooley 1983; Warburton and Klimstra 1984; Dimmick and Minset 1987). For example, leaving wheat stubble in a field after spring harvest can provide excellent nesting cover for bobwhite quail (*Colinus virginianus*) and ring-necked pheasant (*Phasianus colchicus*) where that component of their habitat is limiting. No-till agricultural practices are in use on some Corps project lands but need to be further tested to determine regional suitability.

Fire can be used as an effective management tool for many game and non-game species, and altering the frequency of burning can improve the value of habitats for a variety of wildlife in addition to the target animal (Roberts and Martin 1989). For example, burning

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a mature pine (*Pinus* sp.) stand every 3 to 5 years in the Southeast is sufficient for white-tailed deer (US Forest Service 1980), but stands may become too dense for quail and turkey if not burned every 1 or 2 years. A multiple species approach would consist of shortening the frequency of burning on portions of these areas to improve habitat conditions for quail and turkey as well as deer. Since hard- and soft-mast-producing species comprise a major part of both birds' diets, it is desirable to ensure that portions of stands are burned only every 3 to 4 years (McRae et al. 1979). Therefore, by simply manipulating burning schedules, benefits to multiple species can be realized. Food for quail and turkey cannot be produced in dense sapling or small pole stands, thus these sites should not be burned more often than is recommended for deer management.

Timber management practices on Corps lands often include strategies to improve habitats for major game species, but management alternatives for nongame species are seldom addressed. Modified forestry practices that should be considered to provide multiple species benefits include maintenance of snag trees and downed timber; restoration of riparian habitats; development of forested buffer strips; and modifications to clear-cuts to retain shrub species, leave wolf trees (poorly formed trees that have low economic values but provide important wildlife habitat), and create irregular boundaries (Evans and Conner 1979; Hassinger, Schwarz, and Wingard 1981; Dickson, Conner, and Williamson 1983; DeGraaf and Shigo 1985). These and other forest management strategies will be examined as part of this study.

Traditional wildlife food plots often consist of plantings of 1 or 2 commercially available species. However, seeds and seedlings of new or improved varieties are being tested experimentally and may be obtained from commercial, State, or Federal nurseries. For example, a new variety of bicolor (*Lespedeza bicolor*) that could prove beneficial to game birds is "Amquail." The variety produces an abundance of seed and is highly resistant to browsing by deer (Surrency 1988). It has a bushy growth form, which provides the additional benefit of cover to a variety of species.

Seed mixes of native perennials or reseeding annuals can be especially beneficial to small-game and nongame species. For example, establishing partridge pea (*Cassia fasciculata*) and beggar's ticks (*Desmodium* spp.) adjacent to woody cover will improve food and cover resources for quail and other seed-eating birds; excellent cover will also be provided for cottontail rabbits (*Sylvilagus* spp.) and other small mammals. This type of habitat will need little maintenance, except for occasional burning or discing, and will become invaded by a variety of other native species, thus resulting in a diverse herbaceous community.

The proposed work on multiple species management will consist of the following phases: (a) background survey of potential management strategies; (b) comparison of methods for further study; (c) field application of selected strategies; (d) evaluation of the success of multi-species management at project field sites; and (e) development of a technical report on multiple species management strategies, to include guidelines for their application at Corps projects. Other methods of technology transfer will be included, as appropriate.

## Discussion

The emphasis of the proposed study will be to identify and implement management actions that provide simultaneous benefits to a variety of species, while continuing to improve habitat quality for the species of major interest. Many existing multiple species strategies have considerable application to Corps lands; some of these practices have been recently implemented on several projects, but they have not been widely used.

The study will emphasize the application of cost-effective techniques and selection of low-maintenance vegetation plantings for wildlife habitat development. Other management strategies/options to be examined will include improving site preparation techniques, optimizing spatial arrangement of cover types to produce food and cover, maintaining large woodland tracts for interior forest species, and developing vegetative corridors where habitats have been fragmented. Low intensity surveys will be used to evaluate the success of strategies tested at selected project sites.

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# EVALUATING THE EFFECTIVENESS OF SIGNING FOR PROTECTING ARCHAEOLOGICAL SITES

by  
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## Problem

Under Federal law, particularly the National Historic Preservation Act of 1966 (Public Law 89-665; 80 Stat. 915) and the Archaeological Resource Protection Act of 1979 (Public Law 96-95; 93 Stat. 721) the Corps of Engineers has stewardship responsibilities for cultural resources located on Corps-managed lands. Archaeological sites on Corps lands are finite, nonrenewable, and seriously threatened by a myriad of destructive agencies. Some of the most destructive agencies responsible for the rapidly diminishing archaeological record on Federal lands include serious threats associated with vandalism and other forms of deprecative human behavior.

Corps lands are being heavily used for recreation purposes, more heavily used than lands managed by some Federal Agencies with huge holdings and long-standing missions emphasizing recreation use. The Natural Resource Database System\*\* indicates that the Corps manages only about 1-1/2 percent of Federally owned lands, but a report by the President's Commission On Americans Outdoors (Siehl and Szwak 1986) shows that 27 percent of all reported recreation visitation occurs on the relatively small Corps land holdings.

Research is urgently needed to objectively evaluate the magnitude of vandalism and recreation use impacts on cultural resources located on Corps lands. The seriousness of the vandalism problem has been recently discussed in a report prepared by the Congress of the United States, Office of Technology Assessment (OTA) (1986). The OTA report specifically calls attention to problems of vandalism as well as heavy visitation impacts on recreation areas. Effective cultural resource management begins only when we know the nature of the beast we are attempting to manage.

The growing seriousness of vandalism as a problem of international proportions was recently the subject of a special session of the Society for American Archaeology 1989 annual meetings. Reliable data documenting the seriousness of the vandalism problem are hard to come by but agencies are beginning to report alarmingly high rates of destruction. The National Park Service in a recent sample survey of National Register properties concluded that 50 percent of all archaeological sites, including those on private property have been looted or vandalized or are threatened with looting or vandalism (National Park Service 1988). Statewide statistics show that more than half of the recorded 34,000 archaeological sites for Texas have been subjected to severe disturbance (Biesaart, Robertson, and Clinton-Spotts 1985). A review of the Arkansas statewide automated database on archaeological sites indicates an even higher rate of destruction. In Arkansas

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\*\* Personal Communication, 1990, Judy Rice, NRRP Technical Monitor, Natural Resources Management Branch, US Army Corps of Engineers, Washington, DC.

over 30 percent of the properties listed on or considered eligible for inclusion on the National Register had been either totally destroyed or subjected to major damage (Limp 1987).

The use of signs on archaeological sites to prevent vandalism and other forms of depreciative behavior is a controversial and poorly understood subject. There exists little objective evidence to allow one to evaluate the effectiveness of various signing strategies for protecting sites under various conditions. Various signing techniques have been widely employed but there has been virtually no research undertaken to formally evaluate, through time, the relative effectiveness of different signing strategies for actually protecting sites. We routinely use signs but we do not really know how effective they are.

### **Objective**

The objective of this research is to experimentally evaluate, over time, various signing techniques to see which types of signs work best under specific controlled conditions. Formal evaluation of the effectiveness of signing strategies will require developing objective and quantitative methods of assessment and measurement. A rigorous assessment of signing effectiveness will serve as the basis for developing a set of recommendations to be disseminated to cultural resource managers as a tool for determining signing options.

### **Approach**

A formal research design will be prepared after a review of the existing literature dealing with protective signing and a survey of Corps operations with known serious vandalism problems. Study sites will be selected for evaluating representative signing strategies under variable site conditions. This would include preparation of an artificial site as well as real sites being subjected to impact. Objective methods for identifying and detecting change on artificial and real sites, as well as signed and unsigned sites, will be crucial. Longitudinal monitoring will be undertaken to evaluate short-range, mid-range, and long-range change detection.

Formal site monitoring using a questionnaire or monitoring form will be conducted to acquire specific information needed for analysis and hypothesis testing. In the interest of keeping project costs low and the research strategy uncomplicated, site condition monitoring will emphasize rapid but reliable observations about site conditions that will be both mapped and measured using available air photos and site maps appropriate for monitoring on a macro-scale. For monitoring smaller scale changes also indicative of serious deleterious processes, artifact controls will be carefully placed on an artificial control site after describing, photographing and positioning these on the surface of the site. A beaded line will be used to measure the exact position of specially "seeded" highly collectible control artifacts. Items which we have no reason to believe would be desirable to unauthorized collectors will also be placed on site using the same positioning and measuring techniques. In this way it will be possible to know exactly what has been removed from the control site and at the same time have some control over natural agencies that could also account for these losses.

## **Products**

The products listed below would be generated by this work unit.

- a. Proceedings program review (annually).
- b. Technical note (describing research design, site selection, artificial site and assemblage preparation).
- c. Technical note on mid-range findings.
- d. Journal article.
- e. Technical note on long-range findings and final results and recommendations.

## **Benefits**

The results of the work unit will have application to recreation areas, safety zones, and other natural resource management areas. The primary benefit of this work unit will be well-substantiated and defensible guidance to managers on the most effective signing strategies for deterring vandalism and deprecative behavior on Corps lands. Secondarily this work will also result in objective methods to assist managers in identifying, evaluating, and documenting vandalism impacts to archaeological sites. Thirdly, this research will result in a much better understanding of the specific conditions where management strategies other than signs should be employed.

### **Field Interest in Signing Research**

In the summer of 1989, a questionnaire was sent to all Corps of Engineers Divisions and Districts as well as other Federal and State Agencies with cultural resource management responsibilities. The questionnaire specifically asked if there was a need for field research on sign effectiveness as a deterrent to vandalism. All but one District responded to the questionnaire. Of the respondents, 93 percent (including Corps Districts and Divisions) answered yes to the need for field research evaluating the effectiveness of signing in preventing vandalism. This response clearly suggests a perception in the field that research is needed to assist heavily burdened managers to better cope with the severe problem of rampantly destructive archaeological vandalism and deprecative behavior.

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## **MEASURING THE EFFECTS OF ALTERNATIVE RECREATION FEE PROGRAMS**

by  
**R. Scott Jackson\* and H. Roger Hamilton\***

The Corps of Engineers has charged recreation use fees since the passage of the Land and Water Conservation Fund Act of 1965. During the early 1970's, the Corps charged entrance fees for a brief period. This practice was soon discontinued in response to severe public opposition. During a 6-year period in the decade of the 70's, seven public laws affecting fees for outdoor recreation use at Corps lakes were enacted.

This very brief history of the Corps recreation fee program is indicative of the nature of the visibility and controversy associated with fee policy. Currently, legislative and administrative actions seem to indicate a revival of interest in this topic. Where national policy on this issue is going and where it will end is uncertain. We are certain, however, that we are not armed with enough information to adequately respond to overtures relative to changes in fee policy or to influence the shaping of such policy.

Managers do not have adequate information about how visitors respond to changes in recreation use fees. We do not know what type of cost recovery mechanisms can be implemented, where they can be implemented, or what specific services might be assessed. Thus, the ability to predict the potential effectiveness of alternative recreation fees to achieve management objectives is limited.

The objective of the proposed work unit is to identify and evaluate the effects of alternative fee structures on recreation use patterns and revenues. This process will better prepare us to make informed decisions about formulation and implementation of fee strategies that might meet management objectives and serve the public needs.

A system of recreation research demonstration units, comprised of representative Corps lakes geographically distributed throughout the United States, has been established. The projects in this system will be used as outdoor laboratories to experiment with various fee structures. User response to the fee strategies will be studied and results identified.

Fundamental questions regarding public response to management actions will be addressed during the course of this research. For example, differential fee structures may be an effective means of diverting recreation use from overused projects or recreation areas, or during peak use periods. Negative impacts to the public as a result of increased recreation fees may be mitigated by offering an array of site fees based on differences in amenities associated with individual sites. Amenities include shade, grass cover, proximity to the lake, water and electricity hookups, and a variety of other attributes.

Recreation use patterns and revenues will be evaluated under a variety of fee structures, resource settings, and market conditions. Regional variations can also be examined since the recreation research demonstration units are located all across the country.

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Fee schedules and strategies will necessarily need to be consistent with national policy and law unless special arrangements can be made for the experimental designs.

Cooperative fee structures will be developed with input from experienced field personnel. Interim evaluations in the form of technical reports will be provided annually for 3 years of the study.